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ENTOMOLOGIST'S GAZETTE

April, 1957

Vol. 8, No. 2

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NEWS AND VIEWS

Although somewhat late we cannot omit mention of the remarkably fine piece of field work of Dr. H. B. D. Kettlewell in tracking down the breeding place and working out the ecology and habits of *Lithophane lapidea* Hübner (LEP: NOCTUIDAE) in Britain. This was chronicled in *The Entomologist* for January, 1957. It is illustrated by a most illuminating plate and the text is both fascinating and comprehensive. If any *Gazette* reader has not seen the paper referred to he should read it at the first opportunity as an example of the way that a piece of work of this kind ought to be tackled. There are still numbers of unsolved mysteries concerning the life histories or distribution of British Macro-lepidoptera, and it is to be hoped that Dr. Kettlewell's continued work in this field will stimulate others to emulate his example.

We take pleasure in welcoming a new and very important entomological periodical. The first number of *The Journal of Insect Physiology* will be published in London during this spring. Although the annual subscription is as high as £6, we feel sure that the response will be great and we wish the publishers every success.

The Field Studies Council (why on earth it was felt necessary to alter the title from *Council for the Promotion of Field Studies* we do not know—conciseness is desirable but confusion is quite inevit-

able in the future) continues to do great work and their Annual Report is always a pleasure to read. A more deserving cause from the entomological viewpoint it would be hard to imagine—and a chance to help presents itself. The Council is appealing for Capital in order to consolidate its position and for other worthy purposes which are fully explained in a printed leaflet which may be had on application to the Publicity Secretary—*Mrs. F. H. C. Butler, B.A., Ravensmead, Keston, Kent.*

DAPHNIS NERII (L.) IN DEVON (LEP: SPHINGIDAE)

On 15th September, 1956, I had the good fortune to catch a specimen of the Oleander Hawk Moth, *Daphnis nerii*. When found it was in the sea, but was still alive and had obviously not been there long. It has a wing span of four and a quarter inches and is two inches in length.

12 Nelson Road,
Brixham, S. Devon.

ROGER F. MARKEY.

TWO NOTEWORTHY LEPIDOPTERA RECORDS IN 1955

I find that whereas *Celerio galii* (Rott.) has been taken on numerous occasions in past years in East Sussex, a worn male at Arundel on 26.8.55 appears to be the first known specimen from West Sussex.

Compilers of Kent records will glad to know that *Nola aerugula* (Hb.) (*centonalis* (Hb.)) has reappeared in the county. I took a fresh male at Ham Street on 24.7.55 at the light of an ordinary paraffin lamp: the moth was of the plain whitish-grey form.

G. HAGGETT.

We regret that the above note was set up at the end of 1955, but overlooked. As the records are of some local importance we print them now, with an apology for the delay.—EDS.

**CELERIO GALII (ROTT.) IN NORTH STAFFORDSHIRE
(LEP: SPHINGIDAE)**

A larva of *Celerio galii* (Rott.), found at Bucknall, Stoke-on-Trent, was brought to Hanley Museum on 7th September, 1955. It was seen there by Mr. B. Bryan, of Longton, who tells me that it pupated two days later and the moth, which is now in my collection, emerged on 3rd August, 1956.

The only previous Staffordshire record of *C. galii* is of a moth taken at Handsworth, near Birmingham, in 1888; the larva has never before been found in the county.

Wood Ridings,
32 Whitmore Road,
Trentham, Staffs.
2nd January, 1957.

R. G. WARREN.

THE LIFE-HISTORIES OF TWO SPRING SPECIES OF DRAGONFLY (ODONATA: ZYGOPTERA)

By PHILIP S. CORBET

(*Department of Zoology, University of Cambridge.*)

INTRODUCTION

During a series of visits to the New Forest in 1952 and 1953, the life-histories of several British dragonflies were determined. In a separate communication (Corbet 1957b) I have described the life-histories of two summer species, and have dealt with the methods employed and some of their limitations. In this paper, data concerning two spring species, *Pyrrhosoma nymphula* (Sulzer) and *Agrion virgo* (L.), will be presented. One of these species, *P. nymphula*, was the subject of an earlier adult population study (Corbet 1952), as a result of which its status as a spring species was first recognized.

In the present study all larvae were returned alive to their appropriate habitats after being inspected, except in September 1952, when the last two instars of both species were retained for experimental purposes. It is to be regretted that this was necessary, but it is considered unlikely that it had a significant effect on subsequent samples.

PYRRHOSOMA NYMPHULA

INTRODUCTION

P. nymphula is found throughout Europe and also in Asia Minor; it probably occurs in all counties of the British Isles (Longfield 1949). In Britain it has perhaps the widest ecological tolerance of any dragonfly: larvae develop successfully in swift moorland streams (see Table 1, A), fens or brackish clay marshes (B) and productive gravel ponds (C).

This species is one of the first to emerge in spring. The flying season usually extends from early May to early July, although adults may occasionally be encountered in April or August.

Non-diapause eggs are laid from early May to early July, and hatch in about 2-4 weeks. Evidence for this may be itemized as follows:

(1) Eggs laid at Holmsley on 6th June began to hatch after 18 days (Gardner & MacNeill 1950).

(2) Eggs from Pamber Forest, Hampshire, collected on 15th June, began hatching after 32 days; these were kept in the shade at about 15 deg. C.

TABLE 1

Locations of habitats in which larvae of *P. nymphula* have been found.

Type (see text)	Habitat	County	Nat. Grid Ref.
A	Bicton Common Holmsley Laughter Brook Oberwater River White Moor	Devonshire Hampshire Devonshire Hampshire Glamorganshire	30/040857 41/232010 20/644750 41/250038 21/424900
B	Arthur's Stone Pool Oxwich Lake Wicken Fen	Glamorganshire Glamorganshire Cambridgeshire	21/490903 21/501878 52/562703
C	Colmans Moor Pond Fish Pond Hatchet Pond Withermore Common Pond	Berkshire Berkshire Hampshire Hampshire	41/775731 41/653662 41/367015 40/061932

(3) Larvae in instar 4 (the first in which identification is possible) first appeared in samples from *Potamogeton natans* L. at the Fish Pond on 27th June in 1953. Oviposition probably began on about 15th May; thus, if 2 weeks are allowed for newly-hatched larvae to reach instar 4, eggs took about 4 weeks to hatch. Such a period of incubation is probably longer than is usual in this habitat, since water temperatures were abnormally low during late May and June 1953.

LARVAL DEVELOPMENT

In view of the wide ecological tolerance of *P. nymphula*, it was felt that a study of larval development in a single habitat might not permit general conclusions to be drawn for the species as a whole. For this reason, populations in three habitats (Oberwater, Holmsley and Fish Pond) were studied concurrently. These habitats have been described elsewhere (Corbet 1957a, b).

Larvae of this species can be identified unequivocally from instar 4 (ca. 2½ mm.) onwards (Gardner & MacNeill 1950).

Histograms of larval samples from the three habitats are shown in Fig. 1. The sample from Oberwater in April 1953, and those from Holmsley in October and December 1952, demonstrate clearly the presence of two age-groups and, in all three habitats, disappearance of the senior age-group due to emergence can be observed between April and June 1953. An approximation to the pattern of larval growth, based on the series of samples from Holmsley, is

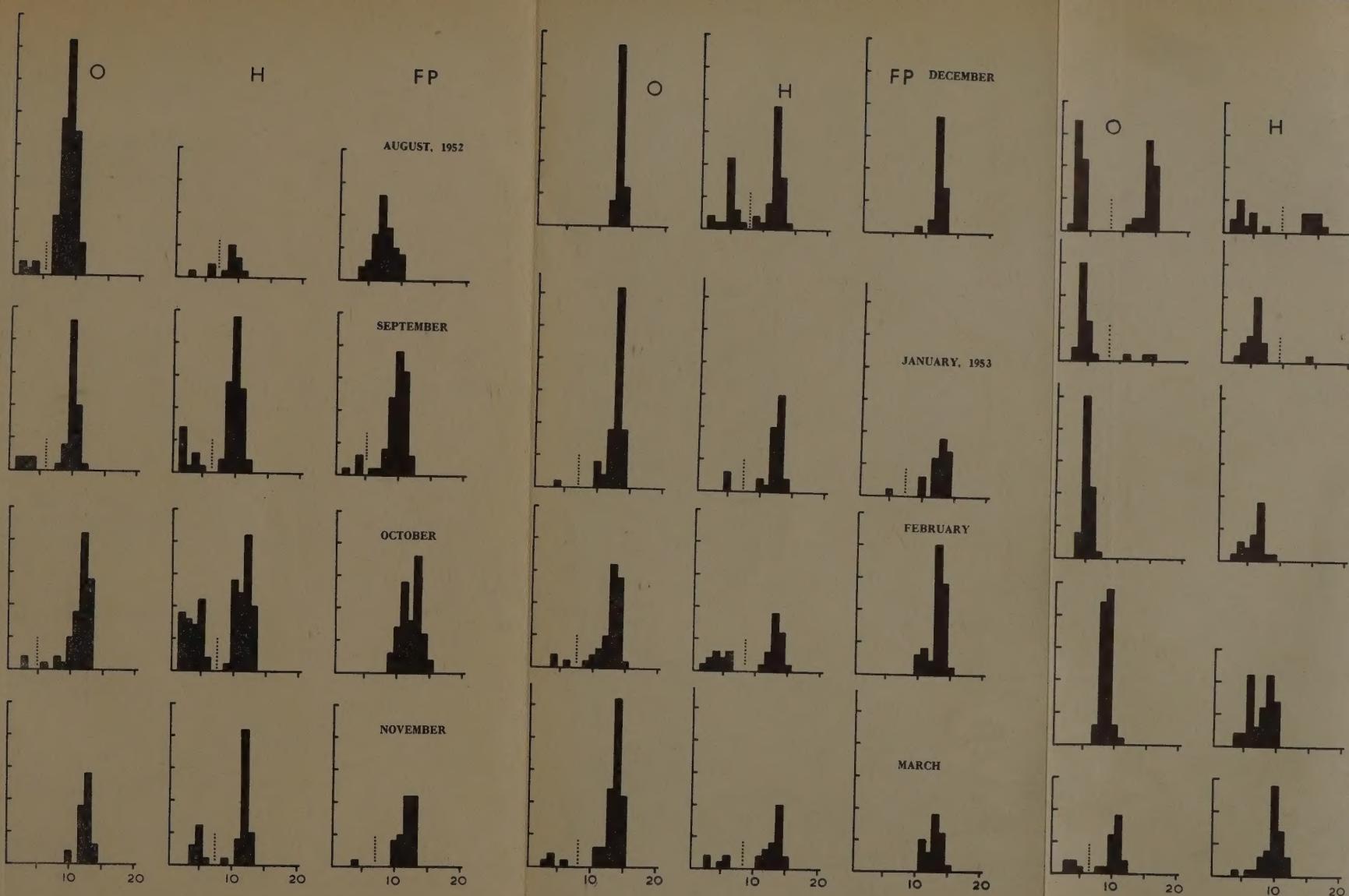


Fig. 1. *P. nymphula*. Histograms of larval samples from Oberwater (O), Holmsley (H) and the Fish Pond (FP) in 1952 and 1953. The dates of samples are given in Table 2. Vertical dotted lines indicate the approximate point of separation of the age-groups.

Abscissa: larval length in mm.
 Ordinate: frequency, in units of 5.

TABLE 2

Dates upon which larval samples of *P. nymphula* were collected in 1952 and 1953:

Month class of sample	Dates of samples			Sizes of samples		
	Ober- water	Holmsley	Fish Pond	O.	H.	F.P.
1952						
August	24/8	24/8	22/8	101	13	42
September	27/9	28/9	26/9	45	67	60
October	26/10	25/10	27/10	55	95	58
November	30/11	29, 30/11	1/12	28	41	32
December	23/12	22/12	1/1	38	54	28
1953						
January	2/2	24/1	3/2	56	33	26
February	1/3	28/2	2/3	45	31	44
March	29/3	28/3	30/3	59	26	24
April	29/4	28/4	25/4	58	22	24
May	4/6	4/6	31/5	27	22	3
June	28/6	28/6	30/6	41	21	22
July	5/8	4/8	—	53	42	—
August	4/9	4/9	29/8	24	34	44

given in Fig. 2. Growth curves at Oberwater and Fish Pond are essentially similar, and so have been omitted. The Holmsley series was chosen on account of the strong representation of the junior age-group.

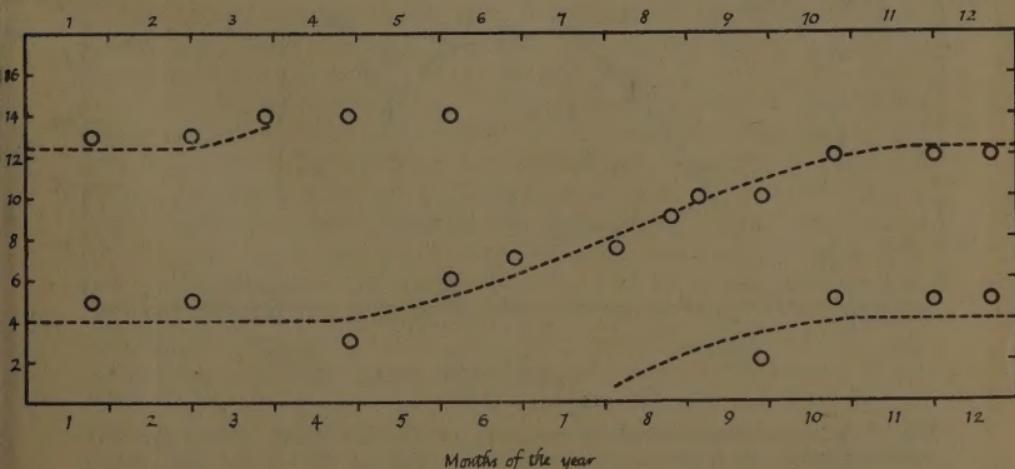


Fig. 2. *P. nymphula*. Diagram of larval growth rate at Holmsley, derived by inspection from Fig. 1.

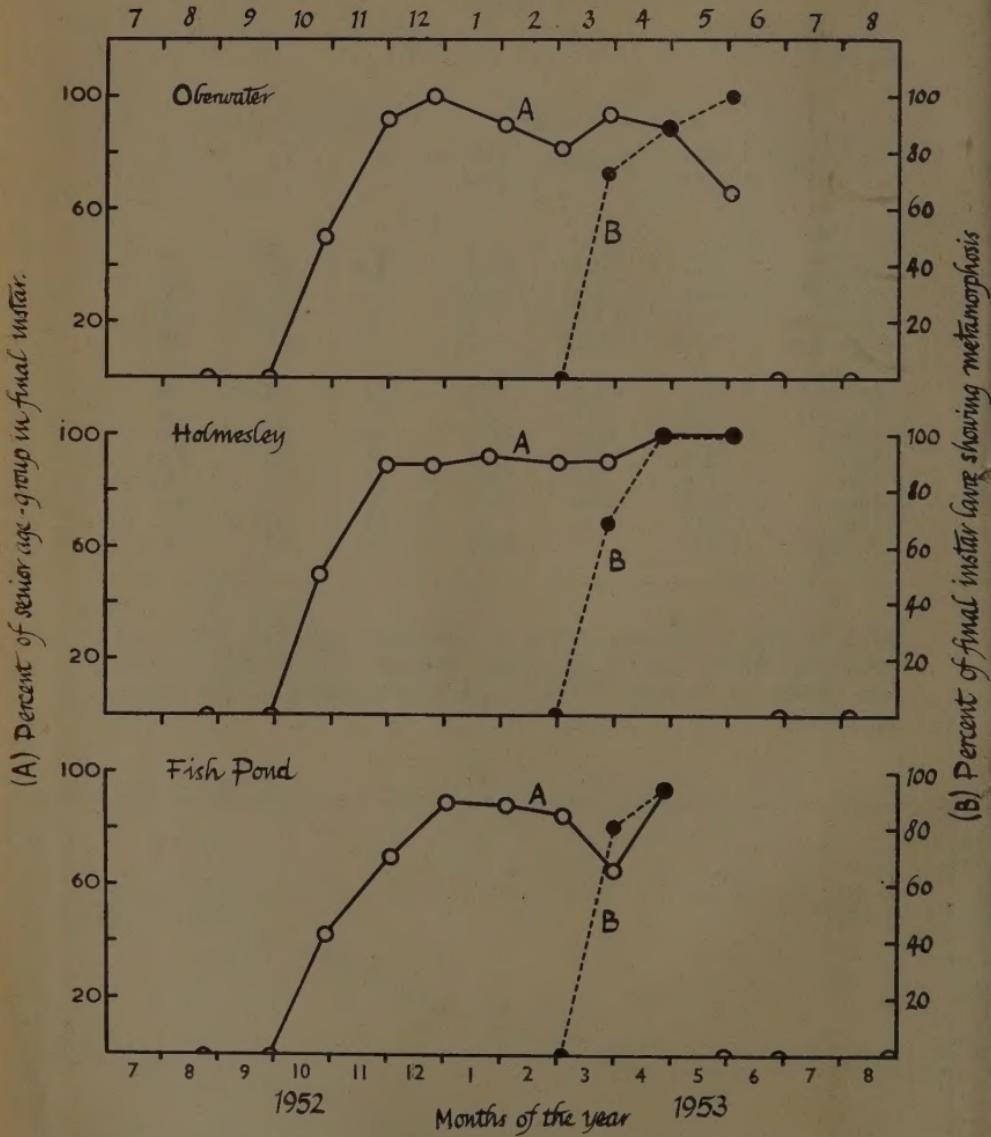


Fig. 3. *P. nymphula*. Seasonal incidence of (A) the final instar, and (B) metamorphosis in three populations. The limits of the senior age-group, used when computing (A), are those shown in Fig. 1. The fall in the proportion of final instar larvae in spring at Oberwater and the Fish Pond is probably caused by size-overlap between age-groups and by emergence.

Observations in other habitats have in all cases supported this interpretation. Two samples from Bicton Common on 20th and 28th July 1949, yielded 136 larvae intermediate in size (see Corbet 1950), and a collection of 128 larvae from Laughter Brook on 10th July 1952, was similar (Fig. 4, A). Two age-groups could be distinguished amongst the 30 larvae obtained from White Moor on 3rd April 1953 (Fig. 4, B).

From Fig. 1 it can be seen that the senior age-group is sampled fairly consistently, but that, during winter, the junior age-group is unevenly represented. From November to April larvae of the junior age-group appear to increase in size, but the return to the autumn value in April indicates that this is an artefact caused by smaller larvae being overlooked. Until more is known about micro-habitat distribution, it is doubtful whether such errors can be avoided. More serious is the confusion of age-groups which is clearly a feature of the Fish Pond sample in August 1952. If assessed independently, this sample would indicate that *P. nymphula* was univoltine with a high thermal growth coefficient, whereas subsequent samples demonstrate that this is not so. Another remarkable feature of samples from the Fish Pond is the virtual absence of larvae of the junior age-group.

It seems clear from Fig. 1 that, in the habitats studied, two seasons are usually required for larval development. The three populations do not differ significantly in this respect. It is possible, however, that univoltinism may be more frequent in shallow productive habitats of the Fish Pond type, where the flying season may begin earlier in the year and where summer water temperatures are more favourable for larval growth. If univoltine larvae formed a higher proportion of the population at the Fish Pond than at Holmsley or Oberwater, this might provide a partial explanation for the difficulty experienced in sampling the junior age-group.

Growth occurs between April and November, and is most rapid between June and September (Fig. 2). Larvae spend the first winter at a length of about 3-4 mm. (ca. instars 5-6; Gardner & MacNeill 1950). By the end of the following September most larvae in the senior age-group have reached the penultimate instar, and about 90 per cent enter the final instar between the end of September and the beginning of December (Fig. 3). The three populations were closely similar in this respect. So also was the population at Laughter Brook: on 26th September 1951, in a sample of 243 larvae, two age-groups were represented approximately equally, and about 3 per cent of the senior age-group had recently entered the final instar. The regularity of this moulting process in different habitats suggests that it may occur in response to some seasonally-consistent environmental factor. In *Anax imperator* Leach, which shows a similar pattern of ecdysis, it has been suggested that moulting is stimulated by equinoctial photoperiods (Corbet 1955).

The seasonal incidence of the final instar and metamorphosis (Fig. 3) shows that the final instar is a diapause stage. It seems likely that the diapause is facultative: teneral final instar larvae have been found at Oberwater on 29th March and 17th May, 1953, and at the Fish Pond on 25th April 1953. The number of larvae entering the final instar in spring is clearly small, but indications that such larvae metamorphose and emerge without delay are provided by the absence of the final instar in summer samples, and by signs of a second peak in the emergence curve (Corbet 1953).

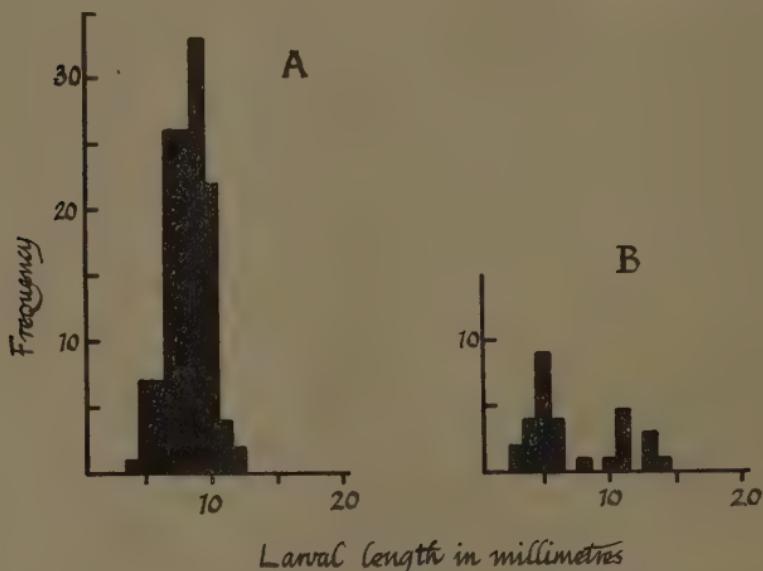


Fig. 4. *P. nymphula*. Histograms of larval samples. A: Laughter Brook, 10th July, 1952; B: White Moor, 3rd April, 1953. At Laughter Brook an age-group of half-grown larvae exists at the end of the flying season. At White Moor, about a month before emergence, two age-groups are present.

AGRION VIRGO

INTRODUCTION

A. virgo is widespread in Europe from France to Russia, and extends across northern Asia to China and Japan. In Britain it is widely distributed, being more common in the south. It is locally common in Ireland, and in Scotland is restricted almost entirely to the west (Longfield 1949). This species occurs mainly in rather swiftly-flowing streams draining moorland and having sand or gravel bottoms. In slower or muddier rivers or streams it is usually replaced by *Agrion splendens* (Harris). The two species seldom occur together.

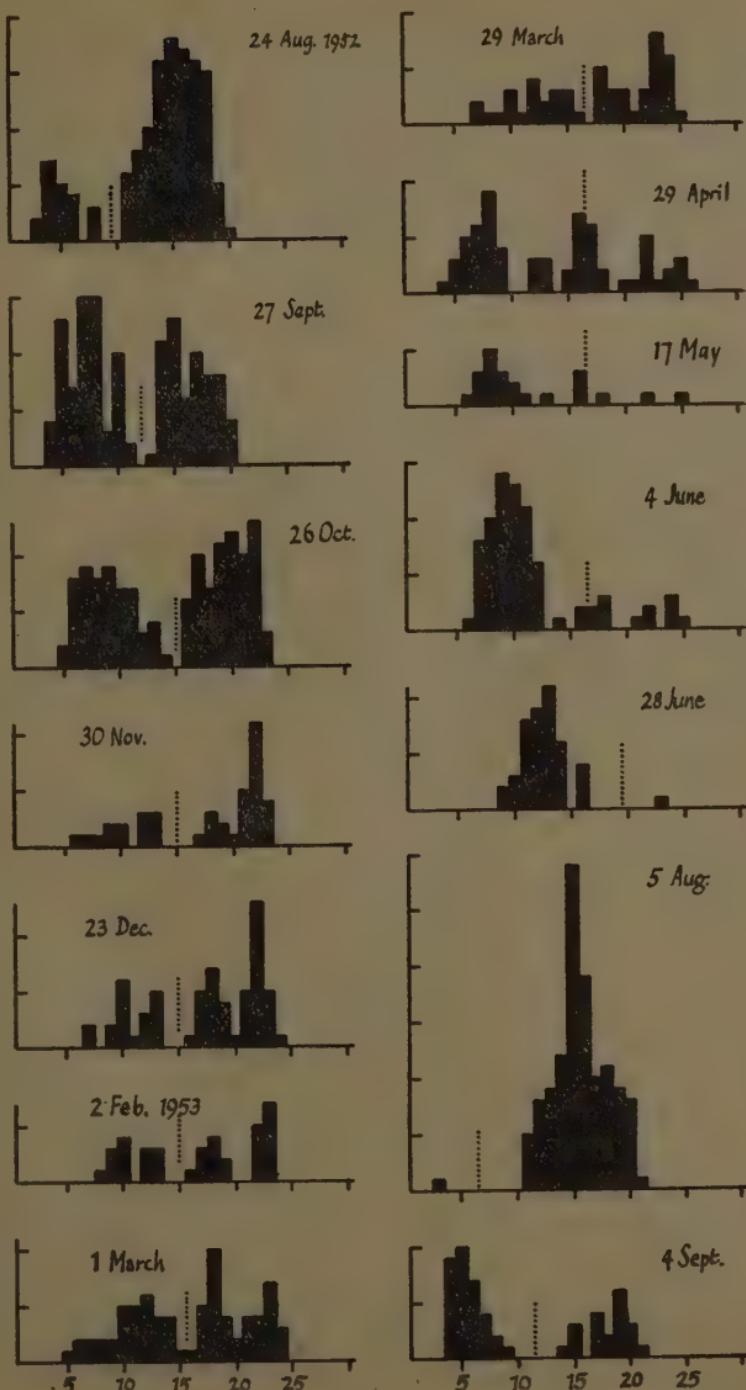


Fig. 5. *A. virgo*. Histograms of larval samples from Oberwater in 1952 and 1953. Vertical dotted lines indicate the approximate point of separation of the age-groups. Ordinates as for Fig. 1.

The flying season usually extends from May to the end of August, adults being found most commonly in June and July (Longfield 1949).

From the field evidence given below there can be no reasonable doubt that the eggs hatch without diapause, probably about 1 month after being laid. In 1953 a small larva (3 mm.) was first encountered on 5th August. Were the eggs to overwinter and hatch in spring, recently-hatched larvae would have been found long before this, probably in April or May, as is the case in *Lestes sponsa* (Hansemann) (Corbet 1956).

LARVAL DEVELOPMENT

The population which formed the main subject of this study existed in the River Oberwater. Small samples have also been collected from Holmsley, the River Avonwater nearby, and Laughter Brook; these support conclusions drawn from Oberwater collections.

Larvae of the genus *Agrion* can be recognized without difficulty (see Gardner 1954), but the two species are very difficult to distinguish, especially in earlier instars. In the present study larvae could be assigned to *A. virgo* with confidence, since this was known to be the only species of the genus occurring in the habitat.

Histograms of larval samples from Oberwater appear in Fig. 5. Samples taken in August 1952 and in August and September 1953 show that two age-groups are present in the population. Progressive removal of the senior age-group due to emergence can be observed

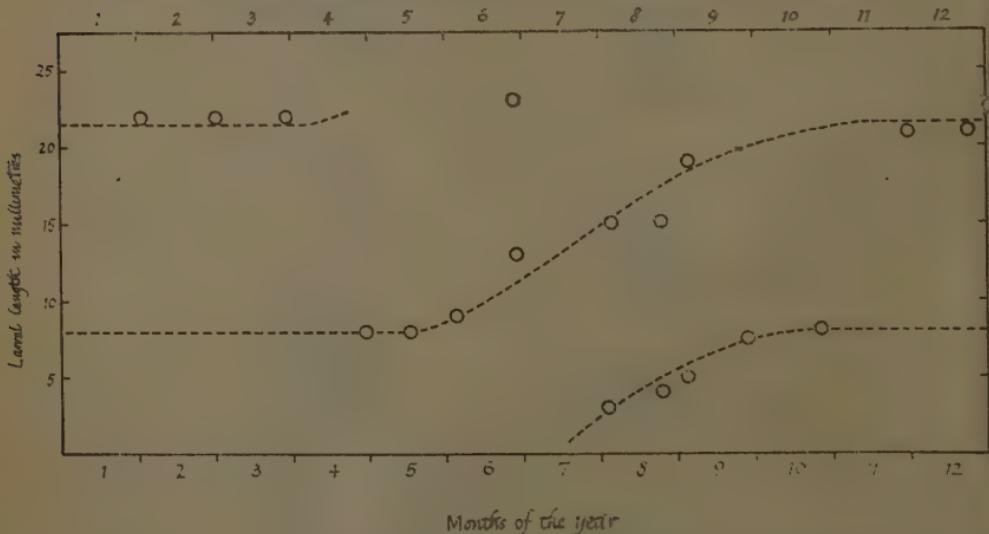


Fig. 6. *A. virgo*. Diagram of larval growth rate at Oberwater, derived by inspection from Fig. 5.

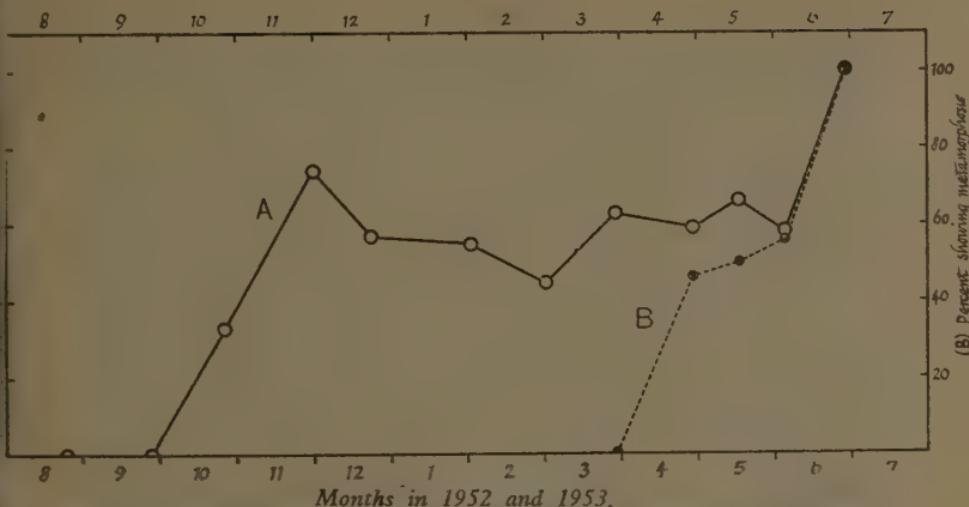


Fig. 7. *A. virgo*. Seasonal incidence of (A) the final instar, and (B) metamorphosis at Oberwater. The limits of the senior age-group, used when computing (A), are those shown in Fig. 5. The distribution of metamorphosis in spring shows that there are two peaks of emergence, resulting from larvae which have overwintered in the final and penultimate instars, respectively. Although this figure probably gives a good approximation to conditions prevailing in nature, it should be noted that sometimes numbers in the senior age-group were very small (see Fig. 5).

between June and August 1953, and the size composition of the persistent larval age-group on 5th August 1953 is such that it must be one season old.

Differential and irregular representation of the age-groups makes it difficult to determine the seasonal limits of growth, particularly as it again appears difficult to sample the junior age-group in winter and spring. However, growth may be said to occur between June and September (Fig. 6). From an inspection of the growth rate it appears that most eggs hatch in July.

It appears that slightly more than half the senior age-group enters the final instar in October and November (Fig. 7), and that the remainder does so in June shortly before emergence. The final instar was not encountered after June or before October. The restriction of metamorphosis to spring indicates that the final instar is a diapause stage, and the uninhibited emergence of larvae entering this instar in spring shows further that the diapause is facultative. Thus, although nearly half of the population enters the final larval instar in spring, the final instar diapause and the low temperature threshold for metamorphosis demonstrate that *A. virgo* is essentially a spring species. The distribution of metamorphosis (Fig. 7) indicates that the emergence curve is bimodal, the first peak probably being larger and better synchronized.

DISCUSSION

P. nymphula and *A. virgo* both resemble *A. imperator* (see Corbet 1957a) in being semivoltine, and in having a diapause in the final larval instar. In both species there are indications that, as in *A. imperator*, the diapause is facultative, and it may well be that the environmental factors controlling it are also similar.

In *A. imperator* the facultative diapause results in there being a second, temporally-dispersed emergence peak which provides about 10 per cent. of the annual population of adults. It seems likely that a similar arrangement occurs in *P. nymphula*. In *A. virgo*, however, this second peak is probably a prominent feature of the emergence curve, since it appears to contribute about 40 per cent. of the adults per year. Unless the longevity of *A. virgo* is very low, the strong development of the second emergence peak would provide a reasonable explanation of its relatively long flying season. Although *A. virgo* is physiologically a spring species, individuals emerging in the second peak behave in the manner of summer species, since they lack diapause and emerge in a temporally-dispersed fashion later in the season. In some circumstances this phenomenon might give the superficial impression that *A. virgo* was double-brooded (i.e. bivoltine). In *P. nymphula* and *A. imperator*, on the other hand, the summer fraction of the population is so small as to be barely discernible.

A respect in which spring and summer species are likely to differ considerably is their lower temperature threshold for metamorphosis. Of the three spring species under consideration, *P. nymphula* has the lowest and *A. imperator* the highest, and their respective flying seasons fall in the same seasonal order. It seems likely that, in this respect, evolutionary trends are proceeding in opposite directions in the two ecological groups. In spring species there will be a tendency for the lower temperature thresholds for metamorphosis to become lower, since most individuals are capable of responding synchronously in spring, and since early emergence may be expected to reduce adult competition with summer species. On the other hand, these values may be expected to become progressively higher in summer species (up to a limiting value determined by the seasonal temperature peak), since in this way temporal variation can be reduced to some extent before emergence (Corbet 1957b).

ACKNOWLEDGMENTS

I wish to thank Professor V. B. Wigglesworth, who supervised this work, and Dr. T. T. Macan for reading and criticizing the typescript. I am also very grateful to my sister, Miss Sally Corbet, for her valued help in the field. I wish to acknowledge financial assistance from the Department of Scientific and Industrial Research.

SUMMARY

1. The life-histories of two dragonflies, *Pyrrhosoma nymphula* (Sulzer) and *Agrion virgo* (L.), have been determined by taking regular larval samples from populations in Hampshire and Berkshire.

2. *P. nymphula* is usually semivoltine. Oviposition extends from early May to early July. The eggs hatch in 2-4 weeks, and larvae overwinter in instars 5-6. Larval growth occurs from April onwards, and about 90 per cent. of an age-group enter the final larval instar between late September and early December. A diapause, which is probably facultative, exists in the final instar. Metamorphosis occurs only in spring and has begun in most larvae before the end of March.

3. *A. virgo* is usually semivoltine. Oviposition extends from May until August. The eggs hatch without diapause, probably in about 4 weeks. During the first winter most larvae are about 8 mm. long. Growth is resumed in April, and about 60 per cent. of the senior age-group enter the final instar in October and November. In these larvae metamorphosis begins in the following April. The remaining 40 per cent. spend the winter in the penultimate instar and enter the final instar in spring. In the second group the diapause, which is a feature of the final instar in autumn, is not developed, and metamorphosis proceeds without delay. This division of the population results in two peaks of metamorphosis and emergence.

4. Attention is drawn to the similarities of these life-histories with that of *Anax imperator* Leach, another spring species. It is suggested that in spring species the lower temperature threshold for metamorphosis will tend to be low, whereas in summer species it will be high.

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NEW ABERRATIONS OF *ARCTIA CAJA* (LINN.) (LEP: ARCTIIDAE)

By S. GORDON SMITH, F.L.S., F.R.E.S.

In the *Entomologist's Gazette* Vol. 7, 1956, 'Experiments with a Remarkable Melanic Strain of *Arctia caja*', by David Wright and S. Gordon Smith, I named several new aberrations. Many broods have since been reared and the following aberrations are considered worthy of being described and named.

The origin of all is various strains, Chester x (Hants. x Norfolk) and they are all related, selected pairings being made in the hope of obtaining new aberrations.

Arctia caja ab. *hectaploa* ab. nov.

Forewing colour like that of typical *caja*, pattern, however, having the medial band with the triple costal mark divided into three separate elements, and the inner marginal mark divided into three very distinct separate spots. Hindwing colour a little brighter than ordinary *caja*.

Type: Female, bred 26.9.1956. S. Gordon Smith coll.

Plate II, Fig. 1.

Arctia caja ab. *tapeta* ab. nov.

Forewing cartridge buff degraded so extensively with fuscous as to almost obliterate the lighter colour; dark markings sepia, darker edged. Hindwing fuscous black, one small antemedial black spot, and three large postmedial black spots. Thorax sepia; abdomen fuscous with black dorsal spots.

Type: Female, bred 15.5.1956.

Plate III, Fig. 3. S. Gordon Smith coll.

Paratype: Female, bred 21.5.1956.

Plate II, Fig. 2. S. Gordon Smith coll.

Arctia caja ab. *hexacha* ab. nov.

Forewing with cartridge buff ground colour with faint traces of buff, dark markings sepia slightly darker-edged; medial band with the triple costal mark divided into three separate elements, and the inner marginal mark divided into three very distinct separate spots. Hindwing vinaceous buff degraded with fuscous, and tinged with rufous; a small black discal spot and three moderately large black postmedial spots with bluish sheen. Thorax sepia, abdomen vinaceous buff degraded with fuscous, with black dorsal spots.

Type: Male, bred 3.3.1956.

Plate II, Fig. 3. S. Gordon Smith coll.

Arctia caja ab. *pentaploa* ab. nov.

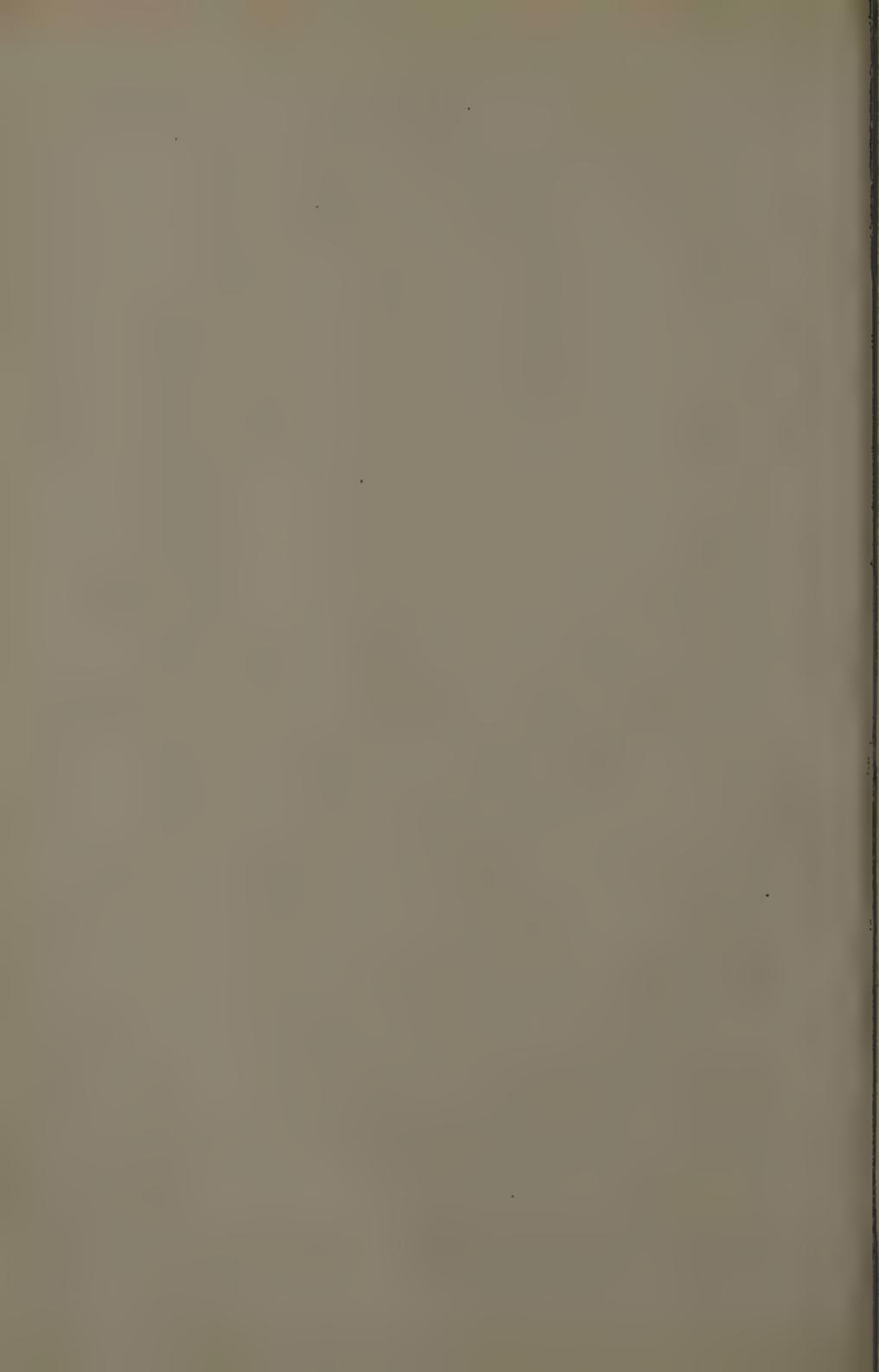
Forewing cartridge buff degraded with fuscous, dark markings sepia, darker-edged, pattern as in figure, notable for the breaking



Photo by W. E. Ashworth.

ABERRATIONS OF *ARCTIA CAJA* (L.)

1. Ab. *hectaploa* Gordon Smith.
2. Ab. *tapeta* Gordon Smith (paratype).
3. Ab. *hexacha* Gordon Smith.
4. Ab. *pentaploa* Gordon Smith.
5. Ab. *pentacha* Gordon Smith.
6. Ab. *monosema* Gordon Smith.



up of the medial band into three costal bars and two inner-marginal spots. Hindwing rufous tinged vinaceous buff degraded with fuscous, the bluish-sheened black spots prominent, the foremost postmedial spot reaching the costa. Thorax sepia, abdomen rufous-tinged vinaceous buff, less noticeably degraded with fuscous than the hindwings and consequently brighter; dorsal spots heavy.

Type: Female, bred July, 1956.

Plate II, Fig. 4. S. Gordon Smith coll.

Arctia caja ab. *pentacha* ab. nov.

Colour near the typical *caja* colour, the lighter tints bright against the rich sepia in the forewings and the black spots of the hindwings; forewing markings notable for the breaking up of the medial band into three costal bars and two inner-marginal spots; hindwing with the foremost postmedial spot reaching the costa, the yellow fringe having a black smudge at the wing apex.

Type: Male, bred 10.5.1956.

Plate II, Fig. 5. S. Gordon Smith coll.

Arctia caja ab. *monosema* ab. nov.

Forewing with cream ground colour more extensive than sepia, dark markings. Hindwing bright rufous-tinged orange, yellow costally, with a single moderately large blue-sheened black spot postmedially across the lower cubital vein. Thorax sepia, abdomen rufous-tinged orange with pronounced black dorsal spots.

Type: Male, bred 3.3.1956.

Plate II, Fig. 6. S. Gordon Smith coll.

Arctia caja ab. *upsilon* ab. nov.

Forewing with the cartridge buff ground colour degraded with fuscous; the dark markings sepia, disposed as in the figure. The reduction of the sepia at the termen to an apical spot seems to have resulted in a heavy massing of that colour along the inner margin from the base to the tornus, and to it is joined the proximal bar of the medial costal mark, leaving the other two bars in the form of an irregular U. Hindwing cinnamon buff degraded with fuscous, the blue-sheened black spots pronounced. Abdomen rufous-tinged cinnamon buff degraded with fuscous, with pronounced dorsal black spots.

Type: Female, bred 11.5.1956.

Plate III, Fig. 1. S. Gordon Smith coll.

Arctia caja ab. *pinax* ab. nov.

Forewing with cartridge buff ground colour moderately degraded with fuscous, dark markings sepia distributed as shown in the figure; a preterminal fascia of weak scaling reaching neither apex nor tornus. Hindwing vinaceous buff suffused with fuscous; three post-medial black spots with a slight trace of purplish sheen. Abdomen, vinaceous buff slightly degraded with fuscous, with dorsal spots black.

Type: Male, bred 25.2.1956.

Plate III, Fig. 2. S. Gordon Smith coll.

Arctia caja ab. *taona* ab. nov.

Forewing cold sooty black over proximal two thirds, rest of wing showing signs of weak scaling and only semi-opaque; cartridge buff markings distributed as shown in photograph. Hindwing with a degraded rufous ocellus with a purple-black pupil and with blotchy purple-black on veins postmedially to subterminally. Head and thorax slightly warmer in tone than forewing, abdomen degraded rufous with purple black dorsal spots.

Type: Female, bred 8.10.1956.

Plate III, Fig. 4. S. Gordon Smith coll.

Arctia caja ab. *clostera* ab. nov.

Forewing fuscous, the dark markings sepia, darker-edged, sub-terminal area semi-opaque with veins prominently darker. Hindwing fuscous with an uneven shading of fuscous black. Thorax sepia; abdomen fuscous with black dorsal spots.

Type: Female, bred 25.2.1956.

Plate III, Fig. 5. S. Gordon Smith coll.

Arctia caja ab. *aclea* ab. nov.

Forewing with the cartridge buff ground colour much reduced in extent, the darker colouring of weak sepia predominating (cf. photograph for pattern); some weak scaling apparent distally. Hindwing rufous-tinged vinaceous buff degraded with fuscous, with a pronounced black antemedial fascia (for shape see figure), and three dull black postmedial spots, the largest extensively occupying the wing-apex. Thorax weak sepia, abdomen rufous-tinged vinaceous buff degraded with fuscous with dull black dorsal spots.

Type: Female, bred 5.8.1956.

Plate III, Fig. 6. S. Gordon Smith coll.

ACKNOWLEDGMENT

My grateful thanks to Mr. W. H. T. Tams for his valuable assistance in describing these aberrations.

ODONATA RECORDS FROM THE INNER HEBRIDES, 1956

I am indebted to Mr. J. D. Bradley for the opportunity of examining a small collection of dragonflies made during July, 1956, from the Isle of Sanday, Inner Hebrides. A fair series of *Sympetrum nigrescens* Lucas were included, also several specimens of *Orthetrum coerulescens* (F.) and *Ischnura elegans* (Van der Lind.).

29 Glenfield Road,
Banstead, Surrey.

A. E. GARDNER.



Photo by W. E. Ashworth.

ABERRATIONS OF *ARCTIA CAJA* (L.)

1. Ab. *upsilon* Gordon Smith.
2. Ab. *pinax* Gordon Smith.
3. Ab. *tapeta* Gordon Smith.
4. Ab. *taona* Gordon Smith.
5. Ab. *clostera* Gordon Smith.
6. Ab. *aclea* Gordon Smith.

OBSERVATIONS ON THE BRITISH AGROMYZIDAE (DIPT.) — IV

TWO NEW SPECIES AND FURTHER ADDITIONS TO THE BRITISH LIST

By KENNETH A. SPENCER, B.A., F.R.E.S.

I. AMONG a number of Agromyzidae swept at Scratch Wood, Middlesex, in June, 1955, was a single specimen of an *Agromyza* sp. new to science, which I describe below:

Agromyza viridominalis sp. nov.

Head

(Fig. 1): Frons at foremost ocellus almost twice width of eye (1.8:1), in profile not visible above eye. Distance from hind-margin of head to base of antennae equal to width of frons. 2 ors and 2 ori. Anterior ors midway between vti and base of antennae, closer to upper ori than to posterior ors. Lower ori more slender but longer than upper, directed inwards. Orbital setulae regular, in single row, extending from lower ori to upper ors. Vertical triangle not greatly differentiated, elongated but barely extending to lower ors. Lunule flat, extending to midway between ori. Cheeks visible as narrow ring below eye, jowls narrow, not greatly elongated at rear, together in centre one-sixth height of eye. Third antennal segment longer in upper half, with normal pubescence.

Mesonotum

Thorax with 5 + 1 dc greatly diminishing in size; 5th dc at, 6th slightly before suture. sa midway between 2nd and 3rd dc. acr thick and irregular, in approximately 8 rows, 7-8 rows of hairs also in ia area. 1 sa, 2 pa, 1 strong ia which is only slightly shorter than 2nd dc. 2 strong prsc.

Wing

Length 3.4 mm. Costa extending strongly to vein $ml+2$, 2nd costal segment $2\frac{1}{2}$ times length of 3rd. r-m in centre of Cell Cd, last segment of $m4\frac{2}{3}$ length of penultimate segment.

Legs

t2 with 2 postero-doral bristles. Colour: frons including orbits uniformly matt black, base of orbital bristles slightly shining. Face matt blackish-grey with slight subshine. Mesonotum greyish-black, predominantly matt but with slight subshine. Legs uniformly black. Squamae yellowish white, with dark, brownish fringe. Abdomen more shining, distinctly metallic greenish-black.

In Hendel's key (1936: 94) the species runs to couplet 7, which should be extended as follows (to include also *A. dipsaci* Hd., which is redescribed below):

7. Schüppchen dunkel gerandet und gewimpert	7a
- Schüppchen hell gerandet und gewimpert	8
7a. Die c reicht bis zur Mündung von r5...woerzi Groschke	(i.l.)
- Die c reicht bis zur Mündung von ml+2	7b
7b. Stirn zum Teil rot	<i>igniceps</i> Hd.
- Stirn schwarz	7c
7c. Mesonotum mit nur 2 dc	<i>duchesneae</i> Sasakawa
- Mesonotum mit 3-5 dc hinter der Naht	7d
7d. 2. Flügelrandabschnitt etwa $3\frac{1}{2}$ mal so lang wie der 3., Abdomen glänzend schwarz, Mesonotum schwarz aber nicht ausgesprochen glänzend	<i>dipsaci</i> Hd.
- 2. Flügelrandabschnitt nur $2\frac{1}{2}$ mal so lang wie der 3., Abdomen schwarz-grün, Mesonotum dicht grau bestäubt	
	<i>viridominalis</i> sp.n.

The new species can be immediately distinguished from *igniceps* Hd. by its black frons and from *dipsaci* Hd. by its shorter second costal segment, its more grey mesonotum and its greenish-metallic abdomen.

Holotype ♀, Scratch wood, Middx., 17th June, 1955, in my collection.

II. On the 13th August, 1955, I found numerous leaf-mines on *Deschampsia caespitosa* (L.) Beauv. at Chippenham Fen, Cambs. Later examination showed these to be of *Agromyza lucida* Hd., *Phytobia pygmaea* (Mg.) and also of a third species. Of this third species I obtained 2 larvae and I noted at the time in my diary 'larva bright green with long posterior spiracles'. Two flies emerged in April, 1956, and the species proved to be new to science.

Phytobia (Poëmyza) deschampsiae sp. nov.

Head

(Fig. 2): Frons at foremost ocellus $1\frac{1}{2}$ times width of eye. Orbita broad but not projecting above eye in profile. Cheeks linear, jowls narrow, together one-tenth height of eye. Lunule high, equal in length to distance between its upper margin and apex of ocellar triangle. 3rd antennal segment axe-shaped, otherwise normal. 2 ors directed upwards, 2 ori directed inwards. Orbital setulae in single row, sparse but distinct.

Thorax

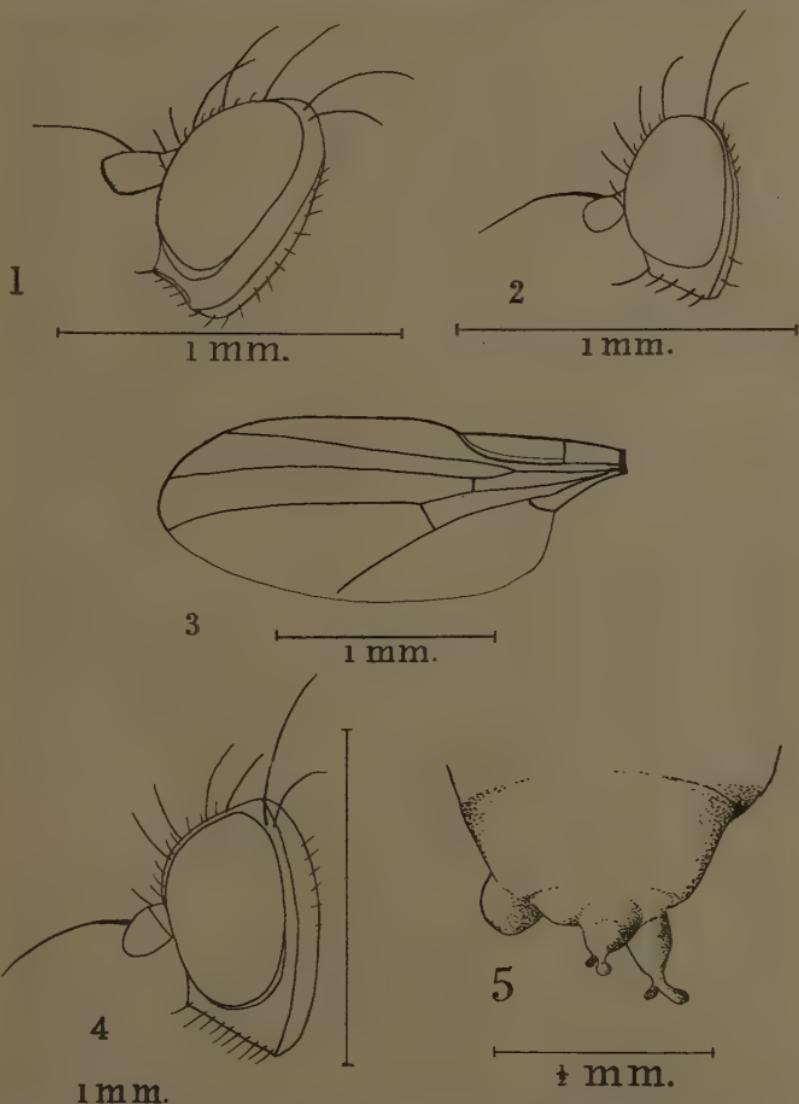
3 + 0 well defined dc, 2nd slightly above level of sa, 3rd close behind suture. No prsc. acr in 5 rows extending to 1st dc, ia hairs numerous in 5 rows.

Wing

As in Fig. 3, last segment of m4 slightly longer than penultimate. Length 2.4 mm. Abdomen closely haired.

Colour

Frons black, somewhat shining; orbits lighter, more greyish and therefore conspicuous. Lunule lighter grey than orbits. Face shining black, jowls blackish-grey. Mesonotum matt black but with distinct subshine. Pleura shining black, mesopleura with narrow, bright yellow



Figs. 1-5. (1) Head of *Agromyza viridominalis* sp. nov. (2) Head of *Phytobia deschampsiae* sp. nov. (3) Wing of *P. deschampsiae*. (4) Head of *Agromyza dipsaci* Hd. (5) Posterior spiracular process of *Phytobia deschampsiae*.

margins. Wing base bright yellow. Squamae yellow with brown margins and dark-brown to black fringe. Legs black, all knees uniformly bright yellow for distance equalling width of the femora. Abdomen matt black with sub-shine.

In Hendel's (1936, p. 18) key the species runs to couplet 31 which should be extended as follows:

31. Alle f-Spitzen gelb, Stirn dunkel, 5-6 Reihen von acr ... 31aa
 - Nur fl an der Spitze gelb, die anderen undeutlich rötlich. Letzter Abschnitt der m4 stets viel länger als der vorletzte. (Sind ausnahmsweise alle f-Spitzen gelb, dann treffen die anderen Merkmale der 1-Alternative nicht zu) 31a
 31aa. Letzter Abschnitt der m4 kürzer als der vorletzte 3 + 1 dc
 morula Hd.
 - Letzter Abschnitt der m4 länger als der vorletzte, 3 + 0dc
 deschampsiae sp. nov

The new species is readily distinguishable from other species in the sub-genus by the combination of yellow knees, black squamal fringe and the longer last segment of m4.

The puparium is slender, light-brown, with conspicuously long, characteristic posterior spiracular processes (Fig. 5). Their broad, long bases are each surmounted by an uneven pair of arms bearing the spiracular buds. The anus is situated on a characteristic protuberance.

Holotype ♀, 20th April, 1956, paratype ♂, April, 1956, Chippenham Fen, Cambs., ex leaf-mine on *Deschampsia caespitosa* (L.) Beauv. (K. A. Spencer), in my collection.

III. For the description of *Agromyza dipsaci* Hd. Hendel only had available a single very imperfect specimen. I have now obtained a short series from Scratch Wood, Middlesex, and examination of these shows that Hendel's fragmentary description is also inaccurate and as a result the species has been inserted in the incorrect place in the key (Hendel 1936, p. 94). I have examined the type in Vienna, which is now entirely mildewed and valueless. I consequently feel justified in designating herewith a neotype and 2 paratypes and redescribe the species as follows:

Agromyza dipsaci Hd. (redescription)

Head

Frons at foremost ocellus approximately $1\frac{1}{2}$ times width of eye, distance from hind-margin of head to base of antennae equal to width of frons. Orbita slightly raised and visible in profile. Cheeks linear, jowls narrow, together one-sixth height of eye. Apex of ocellar triangle forming rightangle, extending only to upper ocs. 2 ocs directed upwards, 2 ori directed inwards and slightly upwards; orbital setulae irregular, sparse above lower ocs. Lunule semi-circular, below plane of frons. 3rd antennal segment rounded, slightly longer than broad.

Thorax

Three strong dc, 2nd at level of sa, 3rd close behind suture; 4th and

5th dc, if present, small and situated irregularly behind or in front of suture. acr rather coarse and irregular, in about 8 rows, thinning between 2nd and 1st dc; hairs in ia area in 4-6 rows. ia weak or absent, 2 pa.

Wing

Length 3 mm. 2nd costal segment $3\frac{1}{2}$ times length of 3rd.

Legs

t2 with 1 or 2 postero-dorsal bristles.

Colour

An all black species. Frons matt black, possibly dark blackish-brown in upper half. Base of or and ocellar triangle somewhat shining. Face predominantly shining black, jowls with distinct greyish dusting. Mesonotum black, slightly shining but distinctly matt, not fully shining as in *nigripes* Mg. group. Squamae grey with long jet black fringe. Legs entirely black. Abdomen more or less shining black.

In Hendel's key the species is included incorrectly in couplet 12. It runs, in fact, to couplet 7 and is included in the extensions to this couplet given in section 1 of this paper. Neotype ♂, 20th May, 1956, deposited in British Museum (Natural History), paratypes 2 ♂, 17th June, 1955, in my collection, all from Scratch Wood, Middx.

ADDITIONS AND DELETION TO THE BRITISH LIST

Agromyza lathyri Hd. *Agromyza watersi* Spencer (in litt.) was described from specimens bred from the indigenous *Lathyrus sylvestris* L. at Luccombe, I.O.W. For several years prior to the discovery of the new species I had noticed mines on various cultivated *Lathyrus* spp., such as *latifolius*, *tuberosus* and *grandiflorus* at Kew Gardens, which agreed both in the form of the mine and in the puparium with *Agromyza lathyri* Hd. which is not uncommon on the Continent. On this evidence this species was added to the British List (Spencer, 1953). All efforts to breed the fly, however, proved unsuccessful until this year, when I obtained a single specimen from a mine on *L. latifolius* in my garden in Hampstead. The species turned out to be not *lathyri* Hd. but *watersi* Spencer. I have also recently noticed mines on the same plant near Wrexham, Denbigh., and at Banstead, Surrey.

Until further evidence on the genuine occurrence of *A. lathyri* Hd. in this country becomes available, this species should therefore be deleted from the British List.

Ophiomyia achilleae Hg. New to Britain. I have 3 specimens referable to this species, one ♂ swept near Tattenham Corner, Surrey, on the 10th May, 1955, and kindly presented to me by Mr. F. T. Vallins, and two ♀ swept at Boxhill, Surrey, on the 18th July, 1956. This species belongs to the small group in which the vibrissal corner forms an angle of 45° or less and in profile extends beyond the 3rd antennal segment. This character immediately distinguishes it from the other species so far recorded in this country. The species forms a shallow,

inconspicuous mine along the stem of its host-plant, *Achillea millefolium* L. It has hitherto been recorded from Germany and Sweden.

O. penicillata Hd. New to Britain. A single specimen in Mr. J. E. Collins's collection, taken at Lyndhurst, Hants., 8th May, 1897. An uncommon species previously only recorded from Austria and Dalmatia. Biology unknown.

Liriomyza richteri Hg. New to Britain. A single specimen swept at Chippenham Fen on the 5th June, 1955. The species belongs to the small group with the characteristically darkened 3rd antennal segment. This is an uncommon species whose food-plant is not known, but it has been taken widely in North and Central Europe.

Phytobia (Dizygomyza) plumbea (Hd.). New to Britain. A single ♂ swept on roadside near Aylesbury, Bucks., on 27th July, 1956. This species was described from a specimen caught in Austria and I have recently determined a specimen taken by Mr. R. L. Coe in Macedonia. It is an uncommon species whose biology is not known, but it is almost certainly a leaf-miner on one of the Gramineae.

Phytomyza achilleae Hg. New to Britain. Mines on *Achillea millefolium* L. on Hampstead Heath, found on 21st July, 1956, produced flies 14 days later. The mine runs down the midrib of the leaf, the larva leaving for pupation through an upper surface exit slit. The fly can immediately be distinguished from *P. matricariae* Hd., which also mines this plant, by its entirely black antennae. In August I also found mines clearly referable to this species at Grasmere, Westmorland; it is doubtless widely distributed with its food-plant.

P. cirsicola Hd. New to Britain. A single ♂ swept near Wrexham, 17th August, 1956. This species has a characteristically large epandrium in the male and the tergites are broadly bordered with yellow. The larva forms a linear mine on *Cirsium* spp., but the species is very much less common than the two other *Cirsium* feeders, *P. cirsii* Hd. and *affinis* Fall. I have now re-examined a specimen in the Hope Department, Oxford, taken by Hamm in May, 1915, and tentatively referred to this species (Spencer, 1953) and am now able to confirm this determination as correct.

Correction. In two papers (Spencer, 1954-5 and 1956) *Liriomyza alpicola* Hd. was inadvertently recorded as in the genus *Metopomyza*; it is of course a true *Liriomyza*.

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19 Redington Road,
Hampstead.
26th November, 1956.

OVER 4,000 FEET: BEING AN ACCOUNT OF COLLECTING WITH MERCURY VAPOUR LIGHT ON BRAERIACH, INVERNESS-SHIRE

By R. M. MERE AND E. C. PELHAM-CLINTON

PART I—NARRATIVE

By R. M. MERE

It started when there was snow on the ground in the early part of 1955. While gossiping with Mr. John Bradley at the British Museum, Natural History, on the coming season, we decided to see if we could discover by means of mercury vapour light any unusual species of microlepidoptera at the top of the Cairngorms. All we were certain about was that in this little worked area no one had ever used mercury vapour light, and clearly to use it at some 4,000 feet was more easily said than done.

I sought the advice and help of Commander Geoffrey Harper, R.N., who lives within sight of the Cairngorms at Newtonmore. Without the great deal of hard work he performed for us the whole trip would probably have come to nothing. All of us concerned wish to thank him, also Colonel Grant, Younger of Rothiemurchus, Mr. Macdonald, Warden of the Cairngorm Nature Reserve, and all others concerned for their very generous and willing help and kindness, often at considerable inconvenience to themselves. The Nature Conservancy, whose permission was sought, were very glad to get records from the Reserve, and gave us much encouragement.

I had expected from Geoffrey Harper a suggestion of the most promising high area to work, and he suggested the plateau at the top of Braeriach. But he did far more. He arranged with Colonel Grant, the owner of the land, and Mr. Macdonald that they should assist us. Colonel Grant promised to provide a pony to carry our generator, and a ghillie too to help with the pony and in transport. This was really magnificent and far exceeded our most optimistic hopes.

The area chosen, the plateau at the top of Braeriach, has an area of nearly two square miles all over 4,000 feet above sea level, and rises gently to peaks of up to 4,250 feet. No other mountain in the British Isles has so large an area at over 4,000 feet. It was thought that here if anywhere was a high area large enough for some alpine or tundral species of microlepidoptera, previously unrecorded in Great Britain, to be breeding. And quite apart from this, we could find no published record of any lepidoptera found in the Cairngorms at near or over 4,000 feet, and it seemed worth while to find out what there might be.

We decided that there should be four of us, so that two could

spend a night collecting at the top, followed by a night's rest when the other two of us would be collecting at the top. Our four originally consisted of Messrs. John Bradley, Eric Classey, Peter Robinson and me. But, much in the manner of ten little nigger boys, we dwindled. Peter Robinson went to Persia, John Bradley bought a new house and had to spend his holiday moving in, and Eric Classey was delayed by urgent business. Thus I alone remained, and happily Mr. Teddy Pelham-Clinton was free and joined me. Here was indeed good fortune, for not only has he collected lepidoptera, particularly the micros, in many parts of Scotland, but he normally camps when collecting, and was fully prepared and equipped to spend nights on high ground. And who but he would have produced a bottle of delicious Tavel rosé, carried up at the bottom of his pack, to enhance our supper prepared on a primus stove at 4,000 feet.

During the spring and early summer information was sought from several collectors of the terrain and conditions likely to be met. Without fail all did their best to dissuade us. None ever went so far as to say to our faces that we were mad. Of course it will be a grand trip, one would say, if ever you get there, but the hills are often in cloud for days on end, and once there you may be marooned in the cloud. I wish I could come, too, another would say, but you know it's always blowing. Why last summer, or perhaps the summer before, there was a well-known botanist up at the top standing at the side of a stream and leaning into the gale. Suddenly the wind dropped and he fell smack into the stream. Now that's typical; just gives you an idea of the normal strength of the wind, and it hardly ever stops blowing. And others told us of rain continuing for weeks on end, of snowfalls in July, and even of deep drifts and snow-covered hills. They could not all be right, and we decided to trust that none was right.

The natural difficulties were weather, wind, rain, fog, and cold. These we had to trust to good fortune to avoid.

One difficulty we were making for ourselves. How was the necessary apparatus to produce mercury vapour light to be lifted to 4,000 feet? It was true that Mr. Peter Robinson had made a wonderful little lighting set that worked one 125 watt lamp, the whole weighing under 60 lbs., but it was still somewhat experimental. Without a competent electrician in the party, there was risk of being unable to start or to keep the generator running. For reliability and ease of maintenance the more usual so-called 'portable' apparatus, weighing a few pounds over 1 cwt., seemed necessary.

The transport of this mercury vapour generator by pony gave us much concern. The pony was supposed to be able to carry 2 cwt. of well-balanced load. The 120 lb. generator could hardly be that, and was very different from a dead stag to carry. By removing the petrol tank from the engine, and having a lightweight base and separate tank, the weight of the heaviest unit was brought down to

102 lbs., still too heavy and unwieldy. Then we had great good fortune. I acquired a lightweight 12-volt d.c. battery charging unit weighing under 50 lbs. By most ingenious rewiring and adaption, Peter Robinson, using a 125-watt choke, made this set light one 80-watt mercury vapour lamp, and it proved entirely reliable and trouble free. Thus the transport problem was solved. A compact 50 lb. unit would not be difficult to balance on a pack saddle.

Our headquarters were Alt-na-Craig, Aviemore, where Miss Brownlie makes entomologists welcome, provides excellent picnics at short notice, allows a mercury vapour moth trap to be run in the garden attached to the electric main supply in the house, does not mind setting boards, pins and other apparatus being scattered round the house, and takes an intelligent interest in our activities. Teddy and I met there on Saturday, 9th July, 1955. On the way I called on Geoffrey Harper to find the latest information about the arrangements he had made for us, and was given a delicious tea by Betty Harper. A few minutes after I left, Teddy Pelham-Clinton also called and obtained the same information, and was suitably refreshed. At Aviemore we met Colonel Grant and Mr. Macdonald, and showed them the generator and other gear that required lifting to the top. They decided that a pony was unnecessary, and that man power would be sufficient.

We were exceptionally fortunate in the weather. We arrived in a heat wave that continued for all our stay. Except for one day, when there were a few storms, the weather was consistently hot and sunny. At times the temperature in the valley at Aviemore reached 80 deg. in the shade. And at 4,000 feet on Braeriach the temperature at night did not drop below 49 deg.

The evening of Saturday, 9th, we dusked, sugared, and ran two mercury vapour generators and lamps in a wood a few minutes' walk from Alt-na-Craig. I was delighted to see my first *Eurois occulta* (L.), and the Scottish form of *Polia tincta* (Brahm) at sugar, and *Thera cognata* (Thunb.) at light. Larvae of *Lygris populata* (L.) were common on bilberry. A further *E. occulta* was found in the mercury vapour trap at Alt-na-Craig the next morning.

On Sunday, 10th, we set out in search of *Zygaena exulans* (Hoch.). We drove some 60 miles through wonderful scenery to Braemar, climbing on the way to 2,000 feet. We followed the only A class road I know that is unmetalled, of single car width, with grass growing down the middle, and with bays here and there for oncoming traffic to pass.

Teddy and I each had a green Morris Minor travellers' car; we had decided independently that this model, taking into account running costs and its purchase price, was as near the entomologists' ideal as we were ever likely to find.

Driving as near as we could to the hill that we hoped was the home of *exulans* we set out on a steep climb. At length we reached

the summit, some 2,000 feet, but no sign of our quarry. Nothing for it but to try again; down we went on the far side, and up and up the next rather higher hill, cheered by taking a fine *Itame brunneata* (Thunb.) as we started our second climb. At length, when it was about 4 o'clock B.S.T. at some 2,200 feet, we saw a *Zygaenid*, and then many more. *Exulans* was abundant, sitting feeding on the flowers of *Lotus corniculatus*, and flying from one patch of flowers to another. They were perhaps past their best, and some were worn, but we had no difficulty in taking some good specimens, and obtaining ova too. A few *Psodos coracina* (Esp.) were flying in the sunshine. We looked upon our day's success as a good omen; we had succeeded in what we had set out to do. But what did we hope to find at the top of Braeriach? We felt far from confident of finding anything. Photographs we had seen showed bare rock and stones.

Next morning, the 11th, we set out to see. There were four of us: Mr. Macdonald the Warden, Willie Ironside, who was Colonel Grant's ghillie, Teddy, and myself. Ironside was aptly named, being a big man of great strength. He told us how during the war he had done training in mountain warfare on skis, carrying a load of, I believe, 70 lbs. So we did not feel too bad when he took the heaviest of our packs.

The four of us carried the following gear: one portable generator, one choke, two mercury vapour lamps, electric cable, one gallon of petrol, one gallon of paraffin, paraffin pressure lamp, white sheet, torches, primus stove, tent, groundsheet, bee smoker, sugar and brush, killing bottles, nets, boxes, tins, etc., warm clothing, mackintoshes, tinned food, sandwiches, brandy and various other odds and ends for camping or collecting. Our loads were from 35 to 55 lbs.

We went as far as possible in Mr. Macdonald's Land Rover, and then continued walking along a gently rising valley path for a while. At some 1,250 feet when already above the tree line we left the path and struck up the hillside. Owing to the drought the going was comparatively easy, the hags and bogs being dry.

Braeriach is a long ridge, the plateau of 4,000 feet and over being about two miles long in a N.E.-S.W. direction, and about a mile wide. The northern and eastern sides of the plateau are precipices dropping up to 1,500 feet. The western side is steep, but climbable, and the southern side less steep, an easier climb but from Aviemore much further. We ascended by the western side, at times following a rough and stony zig-zag track, at others going apparently at random across and up the hillside, but in fact avoiding bad going and guided by small stone cairns. At 3,250 feet is a small plateau with a lake, the waters of which looked black and unfriendly, Loch Coire an Lochain. Above this was sheer rock for several hundred feet, with a large snow-covered area, and we could hear water falling from the top down the face of the rock. We skirted the precipice and at last reached the 4,000 feet plateau.

Braeriach is granite and the plateau is entirely of granite: granite boulders, granite rocks, granite stones, and in places granite pebbles or sand forming a quick-draining soil. Much of the plateau is without vegetation, but there are considerable areas of mosses and low-growing coarse grasses, and here and there extensive patches of *Silene acaulis* (Moss Campion) and *Salix herbacea* (Dwarf Willow). And that was all. We were too high for heather, heath, bearberry, saxifrage, or the other plants found up to 3,500 feet.

Surprisingly enough, near the south-east of the plateau several springs rise and form a stream that falls over the south-eastern precipice. This is the source of the River Dee, and the springs are known as the Wells of Dee. There is a smaller stream to the north-west side that falls into Loch Coire an Lochain. There were still some patches of snow on the plateau on 11th July, but when on the 17th we finally left these were very noticeably reduced.

Between 2,750 feet and 3,250 feet on our way up *P. coracina* was flying in large numbers, and in the same area *Argyroploce schulziana* (Fabr.) was abundant. *Eucosma nemorivaga* (Tengst.) and *Crambus ericellus* (Hubn.) were taken at rather lower levels. Our loads, and in my case also my lack of training, prevented our doing more than net such as happened to fly within our reach. Even without a load the hillside was too steep and rough to make a chase practicable.

Shortly before 3 p.m. Mr. Macdonald and Ironside set out down-hill, and almost immediately I netted a small moth that proved to be *Argyresthia conjugella* Zell., obviously a straggler blown from some valley where its food-plant Rowan occurred.

After pitching the tent near the western edge of the plateau in what seemed a fairly sheltered spot near the stream that drops into Loch Coire an Lochain we spent four hours wandering over the plateau, but the only other lepidopteron we saw was a single *A. schulziana*, not far from the top cairn. There were many flies, a few beetles, a few small birds, and half a dozen sheep. The sky was clear, the sun shining, and the views were superb in every direction. The wind came from the east. Striking the sheer eastern face of the mountain caused the wind to be gusty with very occasional patches of calm. Though for the height and position it was doubtless a calm day, it was windier than we liked. It was nevertheless hot, and I sat in comfort at 6 p.m. at over 4,200 feet in my shirtsleeves.

Dusk was long and late, and there was light in the northern sky all through the night. We sugared some rocks and started the generator soon after 10.45 p.m. At 11.30 a fine fresh *Apamea assimilis* Doub., appeared on the sheet. An hour later an *Eumichtis adusta* (Esp.) arrived. And that was all at light. There was nothing at sugar, but Teddy found a *Bryotropha similis* (Staint.) on a flower

of *Silene acaulis*. At 3.15 a.m., when it was quite light, I set off on the long walk back, leaving Teddy Pelham-Clinton behind. He was determined to spend the whole day and the next night as well at the top. A few insects were seen on the way back, notably *Borkhausenia similella* (Hubn.) flying in some numbers among pine trees about 5.30 a.m.

Teddy Pelham-Clinton spent the whole of the day working the top. He saw one *Aglaia urticae* (L.), caught one *Crambus furcatellus* (Zett.) near the Wells of Dee, and smoked a *Briotropha similis* out of *Silene acaulis*. That night he took two *Apamea assimilis*, one at sugar and one at light, one of a beautiful red colour, and the other black.

During the next few days we collected near Aviemore, at Speybridge, at Dalwhinnie, at Forres and at Findhorn. On the following Saturday, 16th, we again went to the Braeriach plateau. Some hours searching produced one *Elachista*, so far unidentified. The wind was rather strong, and in the hope of better success in a more sheltered spot we moved all our gear down to 3,250 feet, near Loch Coire an Lochain. This move did us little good, for all that we took were a few *Pyrausta alpinalis* (Schiff.). On Sunday we left the generator behind and carried all the rest of our gear down, now lighter by reason of there being no petrol, paraffin or food. Early on Monday morning, while still dark, Ironside fetched the generator down for us, and we set off south, having had a most interesting but somewhat unproductive time on the high ground. In retrospect I think we were very fortunate to take as many species as we did, but were perhaps too early, and the last few days of July and early August might be more productive.

I gathered a few clumps of grass at the top which I placed in a tin, intending to have the grasses named. Unfortunately, I developed mumps a few days after my return, and it was only in mid August that I opened the tin. To my amazement I found a freshly emerged *Colostygia didymata* (L.) in the tin, which must have been gathered accidentally as a pupa with the grasses. The grasses by this time were withered and mouldy, and were not identified.

Among the insects taken at mercury vapour light at Aviemore was a *Spilosoma lubricipeda* (L.) apparently not previously recorded for the district.

The lists of lepidoptera have been prepared by Teddy Pelham-Clinton and follow as Part II of this paper. A few species of other orders were taken: Odonata: *Enallagma cyathigerum* (Charp.) and Trichoptera: *Stenophylax vibex* (Curt) and *Lymnephilus luridus* (Curt.), all in the Nature Reserve at 1,000 to 1,200 feet, kindly identified by Mr. A. E. Gardner. Coleoptera: on the plateau at 4,000 feet and over, in the Nature Reserve: three *Carabus problematicus* ssp. *gallicus* Géhin, and one *Otiorrhynchus arcticus* v. *blandus* Gyll., kindly identified by Mr. F. D. Buck.

PART II—LIST OF SPECIES

By E. C. PELHAM-CLINTON

The order of species and nomenclature is that of Allan, P.B.M. (1949)—‘Larval Foodplants’, except for those species not included therein for which Kloet, G. S. & Hincks, W. W. (1945)—‘A check list of British insects’ has been used.

I. Cairngorm Nature Reserve

(a) Gleann Einich (1000-1750 feet)

SATYRIDAE: *Coenonympha tullia* (Müller).GEOMETRIDAE: *Scopula ternata* Schrank, *Xanthorhoe munitata* (Hübner), *Colostygia pectinataria* (Knoch), *Entephria caesiata* Schiff., *Thera obeliscata* (Hübner), *Alcis repandata* (Linn.).CRAMBIIDAE: *Crambus culmellus* (Linn.), *C. ericellus* (Hübner).PYRAUSTIDAE: *Scoparia ambigualis* (Treitschke).TORTRICIDAE: *Philedone gerningana* (Schiff.), *Tortrix viburnana* Schiff.EUCOSMIDAE: *Bactra lanceolana* (Hübner), *Argyroploce schulziana* (Fab.), *A. palustrana* (Zeller).GELECHIIDAE: *Bryotropha galbanella* (Zeller).OECOPHORIDAE: *Borkhausenia similella* (Hübner), *Pleurota bicostella* (Clerck).HEPIALIDAE: *Hepialus fusconebulosus* (Degeer).

(b) Braeriach (North-west face, 1,750-3,750 feet)

NYMPHALIDAE: *Argynnis aglaja* (Linn.)—seen on two occasions at 3,750 feet.GEOMETRIDAE: *Colostygia salicata* (Hübner), *Entephria caesiata* (Schiff.), *Psodos coracina* (Esper)—2,900-3,250 feet, amongst *Empetrum nigrum*.CRAMBIIDAE: *Crambus ericellus* (Hübner)—1,750-2,000 feet.PYRAUSTIDAE: *Pyrausta alpinalis* (Schiff.)—a few flying at dusk at 3,250 feet.TORTRICIDAE: *Philedone gerningana* (Schiff.)—2,500 feet, two on wing at 6 a.m., *Tortrix viburnana* Schiff.EUCOSMIDAE: *Eucosma nemorivaga* (von Tengs.), *Argyroploce schulziana* (Fabr.)—2,000-3,250 feet, common amongst *Vaccinium myrtillus* at 3,250 feet.

(c) Braeriach (over 3,750 feet)

NYMPHALIDAE: *Aglais urticae* (Linn.)—one, at south end of 4,000 feet plateau.AGROTIDAE: *Eumichtis adusta* (Esper)—4,000 feet, one at light, *Apamea assimilis* (Doubleday)—4,000 feet, two at light and one unusually red form at sugar.

GEOMETRIDAE: *Colostygia didymata* (Linn.)—one pupa amongst grass at 4,000 feet.

CRAMBIDAE: *Crambus furcatellus* (Zett.)—one, near the Wells of Dee.

EUCOSMIDAE: *Argyroploce schulziana* (Fabr.)—one at 4,150 feet, probably a straggler from the lower levels.

GELECHIIDAE: *Bryotropha similis* (Stainton)—two females, one smoked from *Silene acaulis* and the other sitting on a flower of *S. acaulis* at night—probably a regular breeding species on the 4,000 feet plateau.

ELACHISTIDAE: *Elachista* sp.—a worn male, so far unidentified, at 4,000 feet.

PLUTELLIDAE: *Argyresthia conjugella* Zeller—a male, certainly a straggler, at 3,950 feet.

II. Aviemore district (not including Nature Reserve)

SPHINGIDAE: *Laothoe populi* (Linn.).

NOTODONTIDAE: *Pheosia gnoma* (Fabr.), *Notodonta dromedarius* (Linn.), *Lophopteryx capucina* (Linn.).

THYATIRIDAE: *Tethea duplaris* (Linn.), *Achlya flavicornis* (Linn.)—larvae on birch.

LYMANTRIIDAE: *Dasychira fascelina* (Linn.).

ARCTIIDAE: *Spilosoma lubricipeda* (Linn.), *Arctia caia* (Linn.).

AGROTIDAE: *Agrotis vestigialis* (Hufnagel), *Lycophotia varia* (de Vill.), *Graphiphora augur* (Fabr.), *Diarsia brunnea* (Schiff.), *D. festiva* (Schiff.), *D. rubi* (Vieweg), *Ochropleura plecta* (Linn.), *Amathes baia* (Schiff.), *A. c-nigrum* (Linn.), *A. sexstrigata* (Haworth), *A. xanthographa* (Schiff.), *Anaplectoides prasina* (Schiff.), *Eurois occulta* (Linn.), *Triphaena pronuba* (Linn.), *Polia hepatica* (Clerck), *Diataraxia oleracea* (Linn.), *Hadena bicruris* (Hufnagel), *Cerapteryx graminis* (Linn.), *Leucania pallens* (Linn.), *L. impura* (Hübner), *Eumichtis adusta* (Esper), *Antitype chi* (Linn.)—one larva on *Vaccinium myrtillus*, *Apatele psi* (Linn.), *Rusina umbratica* (Göze), *Apamea monoglypha* (Hufnagel), *A. crenata* (Hufnagel), *A. furva* (Schiff.), *A. obscura* (Haworth), *A. secalis* (Linn.), *Procas strigilis* (Clerck), *P. fasciuncula* (Haworth), *Petilampa minima* (Haworth), *Caradrina clavigalpis* (Scopoli), *Plusia chrysitis* (Linn.), *P. bractea* (Schiff.), *P. testucae* (Linn.), *P. pulchrina* (Haworth), *P. interrogationis* (Linn.), *Abrostola tripartita* (Hufnagel).

GEOMETRIDAE: *Geometra papilionaria* (Linn.), *Odezia atrata* (Linn.), *Scopula ternata* Schrank, *Xanthorhoe munitata* (Hübner), *X. montanata* (Schiff.), *Ortholitha mucronata* (Scopoli), *O. scotica* Cockayne, *Colostygia pectinataria* (Knoch), *C. didymata* (Linn.), *Entephria caesiata* (Schiff.), *Perizoma blandiata* (Schiff.), *P. albulata* (Schiff.), *Lyncometra ocellata* (Linn.), *Lygris populata* (Linn.)—full grown larvae and imagines, *Dysstroma*

citrata (Linn.), *Thera obeliscata* (Hübner), *T. cognata* (Thunberg), *Eupithecia absinthiata* (Clerck), *E. castigata* (Hübner), *E. icterata* (de Vill.), *E. nanata* (Hübner), *Venusia cambrica* Curtis, *Cabera pusaria* (Linn.), *Elloptia fasciaria* (Linn.), *Campaea margaritata* (Linn.), *Lycia hirtaria* (Clerck)—larvae on birch, *Biston betularia* (Linn.), *Alcis rhomboidaria* (Schiff.), *A. repandata* (Linn.), *Gnophos myrtillata* (Thunberg), *Bupalus piniaria* (Linn.).

PHYCITIDAE: *Dioryctria abietella* (Schiff.).

CRAMBIDAE: *Crambus dumetellus* (Hübner), *C. culmellus* (Linn.), *C. margaritellus* (Hübner), *C. tristellus* (Schiff.).

PYRAUSTIDAE: *Scoparia ambigualis* (Treitschke), *Mesographa forficalis* (Linn.).

ALUCITIDAE: *Platyptilia pallidactyla* (Haworth), *Stenoptilia pterodactyla* (Linn.).

TORTRICIDAE: *Pandemis cerasana* (Hübner), *Tortrix forsterana* (Fabr.).

EUCOSMIDAE: *Acroclita naevana* (Hübner), *Evetria pinivorana* (Zeller), *Eucosma ustomaculana* (Curtis), *E. cana* (Haworth), *E. tedella* (Clerck), *Argyroploce corticana* (Schiff.), *A. palustrana* (Zeller), *A. decrepita* (H.-S.).

GELECHIIDAE: *Bryotropha galbanella* (Zeller), *Gelechia betulae* (Haworth), *Acompsia cinerella* (Clerck).

OECOPHORIDAE: *Pleurota bicostella* (Clerck), *Depressaria ocellana* (Fabr.)—larvae on *Salix aurita*.

ELACHISTIDAE: *Elachista gleichenella* (Fabr.).

YPONOMEUTIDAE: *Cedestis gysselinella* (Dup.).

GRACILLARIIDAE: *Gracillaria tringipenella* Zeller.

PLUTELLIDAE: *Ocnerostoma piniariella* Zeller, *Argyresthia goedartella* (Linn.).

TINAEIDAE: *Tineola bisselliella* (Hummel).

STIGMELLIDAE: *Stigmella weaveri* (Stainton).

HEPIALIDAE: *Hepialus fusconebulosus* (Degeer)—including one ab. *gallicus* Led., *H. humuli* (Linn.).

(III) Braemar

SATYRIDAE: *Coenonympha pamphilus* (Linn.), *C. tullia* (Müller).

NYMPHALIDAE: *Argynnis aglaja* (Linn.).

ARCTIIDAE: *Parasemia plantaginis* (Linn.).

AGROTIDAE: *Lycophotia varia* (de Vill.).

GEOMETRIDAE: *Scopula ternata* Schrank, *Xanthorhoe designata* (Hufnagel), *X. montanata* (Schiff.), *Ortholitha scotica* Cockayne, *Colostygia pectinataria* (Knoch), *C. salicata* (Hübner), *Entephria caesiata* (Schiff.), *Euphyia bilineata* (Linn.), *Thera obeliscata* (Hübner), *Epirrhoe alternata* (Müller), *Eupithecia satyrata* (Hübner), *E. nanata* (Hübner), *Itama brunneata* (Thunberg), *Psodos coracina* (Esper), *Ematurga atomaria* (Linn.), *Bupalus piniaria* (Linn.).

CRAMBIDAE: *Crambus dumetellus* (Hübner), *C. pratellus* (Linn.), *C. culmellus* (Linn.).

PYRAUSTIDAE: *Pyrausta alpinalis* (Schiff.), *Scoparia ambigualis* (Treitschke).

ZYGAENIDAE: *Zygaena exulans* (v. Hoch. & Reim.).

TORTRICIDAE: *Tortrix viburnana* Schiff.

EUCOSMIDAE: *Eucosma nemorivaga* (von Tengs.), *Argyroploce schulziana* (Fabr.).

GELECHIIDAE: *Bryotropha galbanella* (Zeller).

OECOPHORIDAE: *Pleurota bicostella* (Clerck).

(IV) Forres

PIERIDAE: *Pieris napi* (Linn.).

NOTODONTIDAE: *Phalera bucephala* (Linn.).

THYATIRIDAE: *Tethea duplaris* (Linn.).

AGROTIDAE: *Apamea lithoxylaea* (Schiff.), *A. monoglypha* (Hufnagel), *Procas latruncula* (Schiff.), *Hypena proboscidalis* (Linn.).

GEOMETRIDAE: *Sterrhia biselata* (Hufnagel), *Xanthorhoe designata* (Hufnagel), *X. montanata* (Schiff.), *Colostygia didymata* (Linn.), *Perizoma affinitata* (Stephens), *P. alchemillata* (Linn.), *Euphyia bilineata* (Linn.), *Cabera pusaria* (Linn.), *Alcis repandata* (Linn.).

CRAMBIDAE: *Crambus culmellus* (Linn.).

PYRAUSTIDAE: *Phlyctaenia lutealis* (Hübner), *Pyrausta olivalis* (Schiff.), *Scoparia ambigualis* (Treitschke).

TORTRICIDAE: *Cnephasia interjectana* (Haworth), *Argyrotoza conwayana* (Fabr.).

EUCOSMIDAE: *Eucosma trimaculana* (Donovan), *E. penkleriana* (Fisch. v. Rösl.), *Argyroploce lacunana* (Schiff.).

OECOPHORIDAE: *Borkhausenia pseudospretella* (Stainton).

(V) Findhorn

SATYRIDAE: *Maniola jurtina* (Linn.).

LYCAENIDAE: *Polyommatus icarus* (von Rott.).

NOTODONTIDAE: *Lophopteryx capucina* (Linn.).

ARCTIIDAE: *Arctia caja* (Linn.).

AGROTIDAE: *Agrotis vestigialis* (Hufnagel), *Lycophotia varia* (de Vill.), *Diarsia brunnea* (Schiff.), *D. festiva* (Schiff.), *Ochropleura plecta* (Linn.), *Ceramica pisi* (Linn.), *Cerapteryx graminis* (Linn.), *Leucania pallens* (Linn.), *L. impura* (Hübner), *L. lithargyria* (Esper), *L. conigera* (Schiff.), *Apamea monoglypha* (Hufnagel), *A. secalis* (Linn.), *Procas fasciuncula* (Haworth), *Thalpophila matura* (Hufnagel), *Pyrrhia umbra* (Hufnagel), *Plusia chrysitis* (Linn.), *P. bractea* (Schiff.), *P. pulchrina* (Haworth), *Abrostola tripartita* (Hufnagel).

GEOMETRIDAE: *Sterrhia inornata* (Haworth), *Ortholitha chenopodiata* (Linn.), *Colostygia pectinataria* (Knobch), *C. didymata* (Linn.), *Perizoma blandiata* (Schiff.), *P. albulata* (Schiff.),

Euphyia bilineata (Linn.), *Lyncometra ocellata* (Linn.), *Chesias rufata* (Fabr.), *Epirrhoë alternata* (Müller), *Abraxas grossulariata* (Linn.), *Alcis repandata* (Linn.).

CRAMBIDAE: *Crambus dumetellus* (Hübner), *C. culmellus* (Linn.), *C. perlellus* (Scopoli), *C. tristellus* (Schiff.).

PYRAUSTIDAE: *Scoparia ambigualis* (Treitschke).

ALUCITIDAE: *Platyptilia pallidactyla* (Haworth).

TORTRICIDAE: *Cnephasia osseana* (Scopoli).

EUCOSMIDAE: *Argyroploce cespitana* (Hübner), *Hemimene tanaceti* (Stainton).

GELECHIIDAE: *Bryotropha desertella* (Douglas), *Gelechia mulinella* Zeller, *G. distinctella* Zeller.

STIGMELLIDAE: *Trifurcula immundella* (Zeller).

BOOK REVIEW

The Pine Shoot Moth and related species. Forestry Commission Leaflet No. 40. H.M.S.O., London. pp. 8. 8 half-tone figs. Price 9d.

This admirable little leaflet describes the main features of the life cycles and forest importance of four of the conifer-feeding species of the British Tortricidae: *Evetria buoliana*, *E. turionana*, *E. resinella* and *E. purdeyi*. It would have been much more useful if it had been enlarged even a little to include something about the other conifer feeders related to these four, several of which might be expected to be important in forestry. For example, *E. pinicolana* Doubleday, which is especially interesting since, so far as is known, it is endemic, is plentiful where it occurs, and in the adult stage resembles *buoliana* so closely that the two could be confused. Nor is the common *E. pinivora* mentioned.

The four species dealt with are conveniently kept together in the genus *Evetria*, a procedure which has much to commend it for the present even if it is incorrect. None of them properly belongs in *Evetria* and it is interesting that the very fine illustrations of the characteristic damage caused by each species provide clues to their real generic relationship. *E. buoliana* attacks the leading or lateral shoots, causing a post-horn distortion, *turionana* and *resinella* produce resinous swellings in the buds and shoots, and *purdeyi* mines the leaves. On this basis they fall into three groups, and the morphological characters of the adults indicate that this grouping is generic.

It is of interest that *purdeyi* occurred as a forest pest on the borders of Nottinghamshire and Lincolnshire in the 1940's, as in the 1930's it was known only from the South of England and was presumed to be an imported species.

J.D.B.

THE LARVA OF *AGRYPNIA PAGETANA* CURTIS

(TRICHOPTERA: PHRYGANEIDAE)

By HILMY M. HANNA, B.Sc., M.Sc., F.R.E.S.

(Zoology Department, University of Reading)

On the 26th April 1953, sixty-five full-grown larvae were collected on aquatic vegetation in the canal at Reddish near Manchester. Adults started to emerge in the laboratory on the 26th May and were identified as *Agrypnia pagetana*.

Case:

The cases were up to 35 mm. in length and 5 mm. wide. Ulmer (1909) recorded cases up to 72 mm. in length. The cases were made of pieces of leaves arranged longitudinally. In addition many larvae were found inhabiting empty stems of water plants. Spiral cases were much less common. All the cases were cylindrical in form.

Larva:

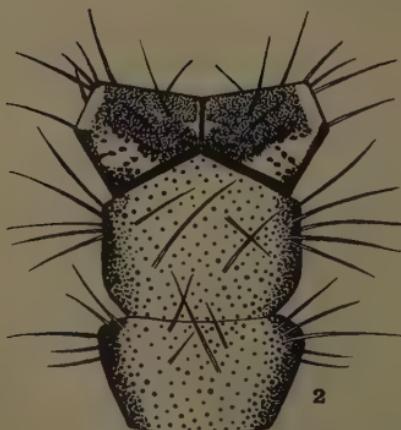
The larva is suberuciform. The larvae examined were up to 26 mm. long and 3 mm. wide. Ulmer (1909) recorded larvae up to 24 mm. in length.

Head:

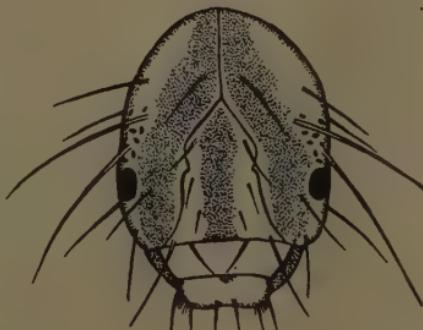
The clypeal band is dark brown and slightly dilated posteriorly. The dark brown bands on the genae converge to make a V. Each gena also has a dark brown band along the side. Posteriorly the genae



1



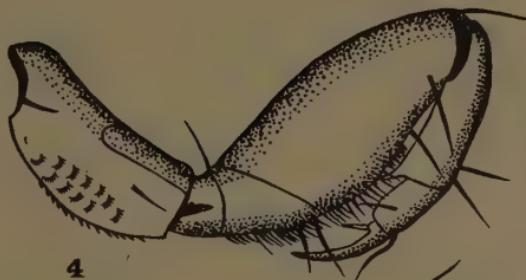
2



3

AGRYPNIA PAGETANA CURTIS

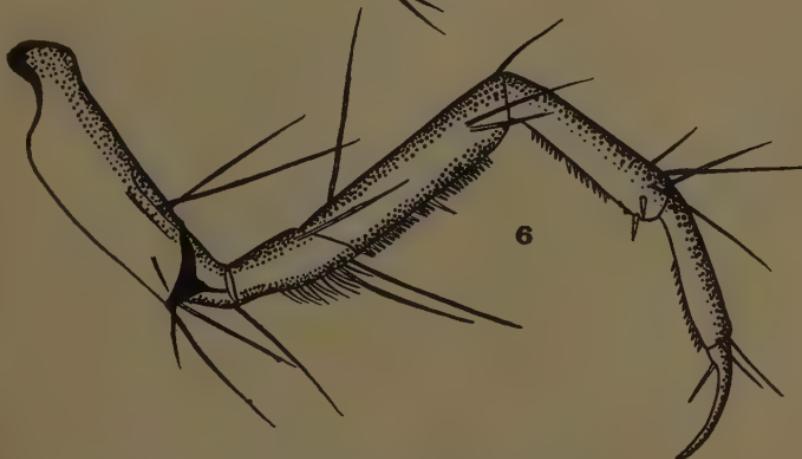
Figs. 1-3. (1) Larval case. (2) Thoracic nota from above.
(3) Head of larva from the front.



4



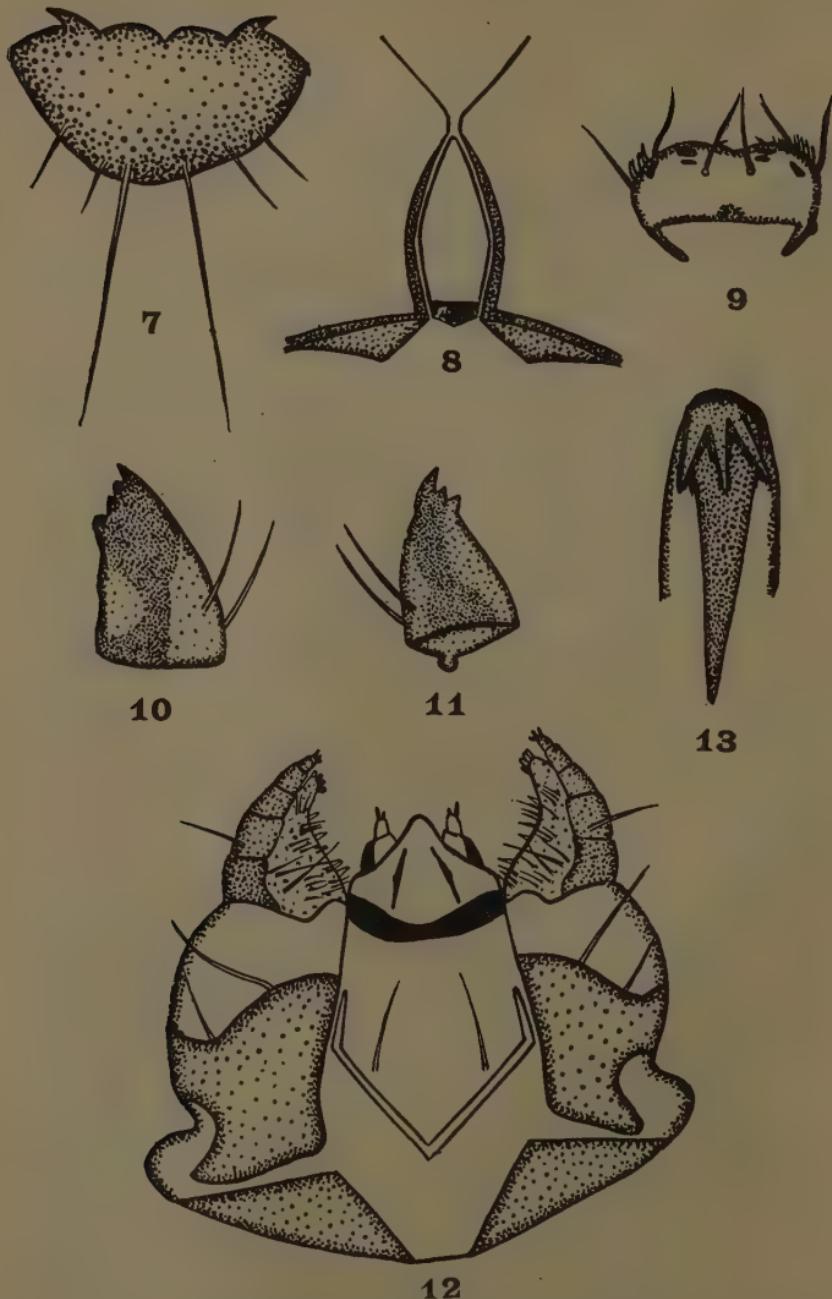
5



6

AGRYPNIA PAGETANA CURTIS

Figs. 4-6. (4) Prothoracic leg. (5) Mesothoracic leg. (6) Metathoracic leg.



AGRYPNIA PAGETANA CURTIS

Figs. 7-13. (7) Anal sclerite. (8) Gular sclerite, posterior view. (9) Labrum. (10) Left mandible. (11) Right mandible. (12) Maxillae and labium. (13) Anal claw from below.

bear dark brown spots. The gular sclerite separates the genae completely.

Labrum:

The anterior margin of the labrum has a slight concavity on each side of which there are three dark brown bands, a median seta, and two marginal setae.

Mandibles:

The mandibles are asymmetric and each bears two long lateral setae near the base. The right mandible has four teeth. The left mandible has six teeth.

Maxilla:

The cardo is small and devoid of setae. The stipes has an oblique proximal margin while the distal margin has a prolongation. The maxillary palp has five segments. The lacinia bears some sensilla and many hairs along its inner margin.

Thorax:

The pronotum which is entirely sclerotised is chestnut brown except for its lateral and posterolateral margins which are golden yellow with dark brown spots. The posterior margins are heavily sclerotised and are almost black, while the lateral margins are dark brown. The mesonotum and metanotum are soft. The prosternal horn is present. The prosternal sclerite is triangular.

Legs:

The prothoracic legs are more flattened and slightly longer than the mesothoracic legs. The inner surfaces of the femora, tibiae and tarsi of all the legs carry small spines and there are a few hairs on the segment of the trochanters.

Abdomen:

On the first abdominal segment there are three protruberances of which the dorsal one is the longest and devoid of setae, while each of the others bears two setae and some short spines. The gill filaments which are present on segments one to eight are single. The anal sclerite bears two anterior projections, while the posterior margin is markedly convex and possesses two long setae and some short ones. The anal appendages are two segmented and the claw has three auxiliary claws at its base. The lateral line running from segments three to eight is formed of fine hairs.

The clypeal band is straighter in the larva of *Agrypnia* than in the larvae of *Agrypnetes* and of *Phryganea*. In *Neuronia* there is no clypeal band and the two bands on the anterior surfaces of the genae are parallel. In *Nannophryganea* the head, pronotum and the legs are dark brown.

The clypeal band was used by Lestage (1921) for separating *Agrypnia pagetana* Curt. from *A. picta* Kol. In the latter species it is more dilated aborally, reaching the converging bands on the genae.

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ULMER, G., 1903, Über die Metamorphose der Trichopteren. *Abh. Naturw. Hamburg* **18** : 40.

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BOOK REVIEWS

The North Staffordshire Field Club Transactions and Annual Report, 1954-55. Edited by H. V. Thompson, 1956. Pp. 123, 6 text figs. Price 10s. 6d.

Of most interest to our readers will be the Presidential Address, 'Entomology in Staffordshire', and various entomological notes. In his Presidential Address, Mr. R. G. Warren reviews the observations made by workers on the Staffordshire lepidoptera up to 1925. The various types of insect habitat found within the county are defined, the characteristic lepidoptera fauna of each type discussed and the distribution of seven species illustrated by maps.

Notes on Odonata, Hemiptera, Trichoptera, Lepidoptera, Hymenoptera and Diptera are included in the Report of Sections. Of special interest is the record of a single male *Erythromma najas* (Hans.) (Odonata) taken by Mr. Warren in Trentham Park, 19th June, 1954. The only previous record of this species being from Cannock Chase.

A.E.G.

Insect Physiology, by V. B. Wigglesworth, 1956 (Methuen's Monographs on Biological Subjects). Size, 4 in. by $6\frac{1}{2}$ in. x + 130 pp., 12 figs. Methuen & Co., Ltd., London. Price 8s. 6d.

In its original edition, this monograph first appeared over twenty years ago. Since that time, many important advances have been made in all branches of insect physiology. The present (fifth) edition has therefore been extensively revised. It is essentially a book for the layman and, as such, provides a clear and concise introduction to its subject. Ten chapters are included, dealing with the integument, respiration, the circulatory system, digestion, excretion, nutrition and metabolism, growth, reproduction, muscles and movements, and the nervous system. There is also a small index.

Naturally, in a work of this modest size, only the major facets of the subject could be considered—and some of these receive rather scanty treatment. However, useful sources of additional information are indicated in the short bibliographies appended to each chapter.

B. P. MOORE.

A LIST OF MACRO-LEPIDOPTERA FOUND NEAR ROSS-ON-WYE, HEREFORDSHIRE

By JOHN E. KNIGHT, F.R.E.S.

THIS LIST is a record of species observed and captured in the area described below during the last ten years by myself with the assistance of Mr. F. R. Sutton, who has visited me frequently. The area worked is based upon my home one and a half miles south of Ross-on-Wye and is entirely in the county of Herefordshire.

My home faces west, and from the front garden farm land slopes gently down to the River Wye, two miles distant. Light on the front lawn is obstructed by the house and surrounding trees and hedges, but the site has been frequently used and proved quite satisfactory. The north side is bordered by old park land. To the south is pasture and half a mile away rises Howle Hill, a limestone ridge. To the east, behind the house, the back garden and orchard slope up to Chase Wood, which is on old red sandstone. Beyond this wood is another, Penyard Park Wood. These two woods represent the northern extremity of the Forest of Dean, though now practically cut off from it. Both are planted with oak and an occasional patch of conifer—larch, Scots pine and cupressus. Chase Wood was felled and replanted 25 to 30 years ago. There are narrow strips of beech and sallow, birch, ash and hazel are intermingled throughout. The ground herbage is very varied, including plenty of bluebell, stitchwort, bracken and bramble with small patches of bilberry, wood rush (*Luzula* sp.) and a few foxgloves. The wood covers a flat-topped hill, and very amateurish tests for pH values suggest that the soil at the top is acid, and the lower slopes alkaline. This is as would be expected and explains the variety of plant life.

Coughton Marsh is a small area of derelict land and water meadows three-quarters of a mile south-west of the house and a mile from the river. The flora includes a blackthorn thicket, alder, sallow, willow, rush (*Juncus* sp.), yellow-flag, marsh bedstraw and great willow-herb.

Most methods of collecting have been used; mercury vapour light became possible during June, 1952, and a trap with an 80-watt lamp has been operated at irregular intervals ever since, usually in the front garden and occasionally in the orchard. It has not been used in any of the other localities mentioned. Sugar, rotten fruit, ivy, sallow, beating, pupa digging and searching have all been productive, but cannot be compared with mercury vapour light for numbers and variety of species.

When a species has not been taken frequently I have preferred to state the number recorded rather than say it is 'scarce' or 'rare'. In many instances the few specimens may be due to lack of activity of the observer at the appropriate time. The fact that the Small Heath

butterfly (*Coenonympha pamphilus* (L.)) has been noted only twice may even suggest lack of observation.

RHOPALOCERA

SATYRIDAE

<i>Pararge aegeria</i> (L.)	Very common
<i>Dira (Pararge) megera</i> (L.)	" "
<i>Agapetes (Melanargia) galathea</i> (L.)	One in Chase Wood 1950 and two in adjacent meadow 1949.
<i>Eumenis (Satyrus) semele</i> (L.)	One in Chase Wood 1948.
<i>Maniola tithonus</i> (L.)	Very common, borders of Chase Wood.
<i>M. jurtina</i> (L.)	Very common.
<i>Coenonympha pamphilus</i> (L.)	Apparently not common. Recorded June, 1949, and July, 1956.
<i>Aphantopus hyperantus</i> (L.)	Very common.

NYMPHALIDAE

<i>Argynnis selene</i> (Schiff.)	Common in Chase Wood.
<i>A. euphrosyne</i> (L.)	Fairly common in Chase Wood.
<i>A. cydippe</i> (L.)	Observed in Chase Wood but not common.
<i>A. paphia</i> (L.)	Fairly frequent in Chase Wood.
<i>Vanessa atalanta</i> (L.)	Very common in 1955.
<i>V. cardui</i> (L.)	Usually quite common, but none seen in 1955.
<i>Aglais urticae</i> (L.)	Common.
<i>Nymphalis io</i> (L.)	Common. More abundant than the preceding species in 1955.
<i>Polygonia c-album</i> (L.)	Common. Less so than usual in 1955.
<i>Limenitis camilla</i> (L.)	Not common in Chase Wood. Occasionally seen in garden.

LYCAENIDAE

<i>Aricia agestis</i> (Schiff.)	One taken in 1949.
<i>Polyommatus icarus</i> (Rott.)	Common in garden and Coughton Marsh.
<i>Celastrina argiolus</i> (L.)	Fairly common in garden and Chase Wood.
<i>Lycaena phlaeas</i> (L.)	Not common in garden and Chase Wood.
<i>Thecla quercus</i> (L.)	Common in Chase Wood.
<i>Strymon w-album</i> (Knoch)	Sometimes quite common in orchard and Chase Wood.

PIERIDAE

<i>Pieris brassicae</i> (L.)	Very common.
<i>P. rapae</i> (L.)	" "
<i>P. napi</i> (L.)	" "
<i>Euchloë (Anthocharis) cardamines</i> (L.)	Common.
<i>Colias croceus</i> (Geoff. in Fourcr.)	A few seen in 1947 and one in 1955.
<i>Gonepteryx rhamni</i> (L.)	An occasional specimen seen. The nearest known locality for the food-plant is $4\frac{1}{2}$ miles away.
<i>Leptidea sinapis</i> (L.)	Chase Wood, one or two seen each year.

HESPERIIDAE

<i>Pyrgus malvae</i> (L.)	One seen in orchard, 1954.
<i>Thymelicus sylvestris</i> (Poda)	Common in Coughton Marsh.
<i>Augiades (Ochlodes) venata</i> (Br. & Grey)	Common in Chase Wood and Coughton Marsh.

HETEROCHERA

SPHINGIDAE

<i>Dilina (Mimas) tiliae</i> (L.)	Fairly common at light and an occasional larva on lime.
<i>Laethoë populi</i> (L.)	Fairly common at light.
<i>Smerinthus ocellatus</i> (L.)	ditto
<i>Deilephila porcellus</i> (L.)	Two at light in 1953.
<i>D. elpenor</i> (L.)	Occasional single specimens at light.
<i>Macroglossa stellatarum</i> (L.)	Common in 1949. A few specimens only in other years.

NOTODONTIDAE

<i>Cerura (Harpyia) furcula</i> (Cl.)	Fairly common at light.
<i>C. vinula</i> (L.)	Two larvae on sallow in orchard, 1950, and a male, at light 20th April, 1956.
<i>Stauropus fagi</i> (L.)	A female at light, 1950.
<i>Drymonia dodonaea</i> (Schiff.)	One at light, 1953.
<i>D. (chaonia) ruficornis</i> (Hufn.)	Fairly common at light.
<i>Pheosia tremula</i> (Cl.)	ditto
<i>P. gnoma</i> (F.)	Very common at light.
<i>Notodonta ziczac</i> (L.)	Common at light and a few larvae observed.
<i>N. dromedarius</i> (L.)	Common at light.
<i>N. anceps</i> (Goeze)	Fairly common at light.
<i>Lophopteryx capucina</i> (L.)	Common at light.
<i>Pterostoma palpina</i> (L.)	Fairly common at light.
<i>Phalera bucephala</i> (L.)	Common at light and a few larvae observed.

POLYPLOCIDAE (THYATIRIDAE)

<i>Habroyne (pyritoides) derasa</i> (L.)	Very common at light.
<i>Thyatira batis</i> (L.)	ditto.
<i>Tethea (ocularis) octogesima</i> (Hueb.)	One at light, 1953.
<i>T. duplaris</i> (L.)	Common at light.
<i>Asphalia diluta</i> (Schiff.)	ditto.
<i>Achlyia flavicornis</i> (L.)	Fairly common at light and ova found in Chase Wood.
<i>Polyploca ridens</i> (Fab.)	Fairly common at light.

LYMANTRIIDAE

<i>Orgyia antiqua</i> (L.)	Common.
<i>Dasychira pudibunda</i> (L.)	"
<i>Euproctis (similis) chrysorrhoea</i> (L.)	Very common.

Lymantria monacha (L.) A female at light, 1954.

LASIOCAMPIDAE

<i>Malacosoma neustria</i> (L.)	Fairly common.
<i>Poecilocampa populi</i> (L.)	Common.

Lasiocampa quercus (L.)

One larva taken in 1948. Three males assembled July, 1956.

Philudoria potatoria (L.)

Common.

Gastropacha quercifolia (L.)

Fairly common at light. A few larvae taken on blackthorn in Coughton Marsh.

SATURNIIDAE

Saturnia pavonia (L.)

A male assembled, possibly an escape.

DREPANIDAE

Drepana falcataria (L.)

Common.

D. binaria (Hufn.)

Only " one at light, 1954.

D. cultraria (F.)

Again only one at light, 1955.

D. lacertinaria (L.)

Common.

Cilix glaucata (Scop.)

NOLIDAE

Nola cucullatella (L.)

Common.

Roeselia (Celama) confusalis (H.-S.)

Fairly common at light.

CYMBIDAE

Bena (fagana) prasinana (L.)

Not common.

Pseudoips bicolorana (Fues.)

Not common at light. Larvae beaten in Chase Wood.

Sarrothripus revayana (Scop.)

Common.

ARCTIIDAE

Spilosoma lubricipeda (L.)

Common.

S. lutea (Hufn.)

Very common.

Cycnia mendica (Cl.)

Not common.

Phragmatobia fuliginosa (L.)

Fairly common at light.

Arctia caja (L.)

Common.

A. villica (L.)

A female taken in orchard, June, 1948, and two males at light, May, 1956.

Hypocrita (Callimorpha) jacobaeae (L.)

Very common. Larvae on groundsel in garden.

Nudaria mundana (L.)

Four or five specimens taken at light. Two taken in Coughton Marsh and two at light.

Comacla senex (Hb.)

Very common.

Miltochrista miniata (Forst.)

Not common.

Cybosia mesomella (L.)

Very common at light and flowers of *Buddleia*. An occasional var. *flava*.

Eilema griseola (Hb.)

Very common.

E. lurideola (Zk.)

Very common.

CARADRINIDAE

Colocasia coryli (L.)

Fairly common.

Apatele megacephala (Schiff.)

Not common.

A. tridens (Schiff.)

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Common. Larvae of both taken.

A. psi (L.)

Common.

A. rumicis (L.)

One specimen to light in 1953, '54 and '55.

Craniophora ligustri (Schiff.)

Common.

Cryphia perla (Schiff.)

<i>Agrotis segetum</i> (Schiff.)	Very common.
<i>A. clavis</i> (Hufn.)	Fairly common.
<i>A. cinerea</i> (Hb.)	One to light in 1952.
<i>A. puta</i> (Hb.)	Very common.
<i>A. exclamationis</i> (L.)	" "
<i>A. ypsilon</i> (Rott.)	Common.
<i>Euxoa nigricans</i> (L.)	Fairly common.
<i>E. tritici</i> (L.)	" "
<i>Lycophotia (Peridroma) porphyrea</i> (Schiff.)	Not common.
<i>Graphiphora augur</i> (F.)	One to light, July, 1951.
<i>Amathes glareosa</i> (Esp.)	One in 1951 and '52, a few in 1954 and '55.
<i>A. baja</i> (Schiff.)	Very common.
<i>A. c-nigrum</i> (L.)	Abundant.
<i>A. triangulum</i> (Hufn.)	Two at light and one bred from larva, 1949.
<i>A. (sexstrigata) umbrosa</i> (Hb.)	Very common.
<i>A. xanthographa</i> (Schiff.)	"
<i>Diarsia brunnea</i> (Schiff.)	One in '48 and two in 1953 at light.
<i>D. festiva</i> (Schiff.)	Common.
<i>D. rubi</i> (Vieweg)	Very common.
<i>Ochropleura plecta</i> (L.)	"
<i>Triphaena comes</i> (Hb.)	Common.
<i>T. pronuba</i> (L.)	Very common.
<i>T. janthina</i> (Schiff.)	"
<i>T. interjecta</i> (Hb.)	Not common.
<i>Lampra fimbriata</i> (Schreb.)	Fairly common at light and <i>Buddleia</i> .
<i>Axylia putris</i> (L.)	Very common.
<i>Anaplectoides prasina</i> (Schiff.)	One to light 1953.
<i>Polia nebulosa</i> (Hufn.)	Fairly common.
<i>Mamestra brassicae</i> (L.)	Common.
<i>Melananchra persicariae</i> (L.)	"
<i>Diataraxia oleracea</i> (L.)	Very common.
<i>Hada nana</i> (Hufn.)	One at rest 1948 and one at light, 1953.
<i>Hadena (w.-latinum) genistae</i> (Borkh.)	One at light, 1953.
<i>H. thalassina</i> (Hufn.)	Fairly common.
<i>H. trifolii</i> (Hufn.)	"
<i>H. serena</i> (Schiff.)	One at light, July, 1951.
<i>H. bicruris</i> (Hufn.)	Common.
<i>Tholera popularis</i> (F.)	"
<i>Charaeas (Cerapteryx) graminis</i> (L.)	At light, one 1952, one 1954 and two 1955.
<i>Thalpophila matura</i> (Hufn.)	One at light, 1954.
<i>Dryobota (Dryobotodes) protea</i> (Schiff.)	Common.
<i>Bombycia viminalis</i> (F.)	Fairly common.
<i>Luperina testacea</i> (Schiff.)	Common.
<i>Aporophyla lutulenta</i> (Schiff.)	One at light in 1949 and 1952.
<i>A. nigra</i> (Haw.)	Three at light in 1954, two in 1955 and one in 1956.
<i>Antitype chi</i> (L.)	One or two at light each year.
<i>Brachionycha sphinx</i> (Hufn.)	Common.
<i>Allophyes oxyacanthalae</i> (L.)	Very common, including var. <i>capucina</i> .
<i>Griposia aprilina</i> (L.)	Two at light, 1955. Pupae very common.
<i>Euplexia lucipara</i> (L.)	Common.

<i>Phlogophora meticulosa</i> (L.)	Very common.
<i>Mormo maura</i> (L.)	One at sugar 1952.
<i>Parastichtis ypsilon</i> (Schiff.)	One at light, 1955.
<i>Apamea sordens</i> (Hufn.)	Not common.
<i>Xylophasia</i> (<i>Apamea</i>) <i>crenata</i>	(Hufn.)
<i>X. lithoxylaea</i> (Schiff.)	Fairly common. A few recorded in 1949, '53 and '55. One at light, 1956.
<i>X. monoglypha</i> (Hufn.)	Very common.
<i>X. (characterea) hepatica</i> (Hb.)	One in 1948 and one in 1953 at light.
<i>X. scolopacina</i> (Esp.)	Fairly common.
<i>Celaena</i> (<i>Apamea</i>) <i>secalis</i> (L.)	Very common.
<i>C. oculea</i> (L.)	Fairly common.
<i>Proculis strigilis</i> (Cl.)	Common.
<i>P. latrunculus</i> (Schiff.)	Fairly common.
<i>P. versicolor</i> (Borkh.)	" "
<i>P. fasciunculus</i> (Haw.)	" "
<i>P. furunculus</i> (Schiff.)	" "
<i>Petilampa minima</i> (Haw.)	" "
<i>Hydraecia micacea</i> (Esp.)	A few taken in 1948 and 1955.
<i>Gortyna flavago</i> (Schiff.)	Single specimens in 1948 and 1952.
<i>Arenostola pygmina</i> (Haw.)	Very common.
<i>Leucania pallens</i> (L.)	
<i>L. impura</i> (Hb.)	" at light each year, 1949, '53 and '55.
<i>L. comma</i> (L.)	Very common.
<i>L. lithargyria</i> (Esp.)	Very common.
<i>L. conigera</i> (Schiff.)	Very common.
<i>Meristis trigrammica</i> (Hufn.)	Common.
<i>Caradrina morpheus</i> (Hufn.)	"
<i>C. alsines</i> (Brahm)	"
<i>C. blanda</i> (Schiff.)	"
<i>C. clavigalpis</i> (Scop.)	"
<i>Laphygma exigua</i> (Hb.)	Two at light in 1949 and one in 1952.
<i>Rusina umbratica</i> (Goeze)	Common.
<i>Amphipyra pyramidea</i> (L.)	Very common.
<i>A. tragopoginis</i> (L.)	Common.
<i>Gypsita leucographa</i> (Schiff.)	Two at plum blossom, 1948.
<i>Cerastis rubricosa</i> (Schiff.)	Common.
<i>Orthosia gothica</i> (L.)	Very common
<i>O. miniosa</i> (Schiff.)	A few at light. Larvae abundant in 1947.
<i>O. cruda</i> (Schiff.)	Very common.
<i>O. stabilis</i> (Schiff.)	" at light in 1955.
<i>O. (populeti) populi</i> (Stroem)	Common.
<i>O. incerta</i> (Hufn.)	"
<i>O. munda</i> (Schiff.)	One in 1948 and '49, four in 1954 at light.
<i>O. gracilis</i> (Schiff.)	Single specimens at light in 1947, '50 and '51.
<i>Cosmia affinis</i> (L.)	Very common.
<i>C. trapezina</i> (L.)	Fairly common in 1951 at light, and in 1956.
<i>Atethmia (xerampelina) centrago</i>	(Haw.)
<i>Anchoscelis (Omphaloscelis) lunosa</i>	(Haw.)
<i>Agrochola lota</i> (Cl.)	One in 1952 and '54, two in 1955 at light.
<i>A. circellaris</i> (Hufn.)	Fairly common.
<i>A. lychnidis</i> (Schiff.)	Very common.
	Very common in many forms.

<i>A. macilenta</i> (Hb.)	Common.
<i>A. helvola</i> (L.)	"
<i>A. litura</i> (L.)	Not common.
<i>Tiliacea citrago</i> (L.)	"
<i>T. aurago</i> (Schiff.)	Not common, one ab. <i>unicolor</i> taken.
<i>Citria lutea</i> (Ström.)	Common.
<i>Cirrhia (icteritia) fulvago</i> (L.)	Very common.
<i>C. gilvago</i> (Schiff.)	Six at ivy and rotten plums in 1948, one at light, 1956.
<i>Conistra vaccinii</i> (L.)	Very common.
<i>C. ligula</i> (Esp.)	Fairly common.
<i>Eupsilia transversa</i> (Hufn.)	Common.
<i>Lithophane semibrunnea</i> (Haw.)	One at ivy in 1950.
<i>L. socia</i> (Hufn.)	One at sugar in 1951.
<i>Graptolita ornithopus</i> (Hufn.)	Common.
<i>Xylomyges conspicillaris</i> (L.)	About ten recorded at light since 1953, mostly ab. <i>melaleuca</i> , but typical and intermediate forms have been taken.
<i>Xylocampa areola</i> (Esp.)	Common.
<i>Xylena vetusta</i> (Hb.)	One at light in 1949.
<i>Cucullia verbasci</i> (L.)	Fairly common as larvae.
<i>C. umbratica</i> (L.)	One at light 1953.
<i>Panemeria tenebrata</i> (Scop.)	Fairly common by day in Chase Wood, 1948.

PLUSIIDAE

<i>Jaspidea (pygarga) fasciana</i> (L.)	An occasional specimen at light.
<i>Rivula sericealis</i> (Scop.)	Two at light 1954, and one flushed in Chase Wood, July, 1956.
<i>Scoliopteryx libatrix</i> (L.)	Very common.
<i>Polychrisia moneta</i> (F.)	Common.
<i>Plusia chrysozona</i> (L.)	Very common.
<i>P. festucae</i> (L.)	One to light in 1948.
<i>P. iota</i> (L.)	Common.
<i>P. (pulchrina) v-aureum</i> (Hueb.)	"
<i>P. gamma</i> (L.)	Very common. Dwarf form taken for the first time in 1955.
<i>Abrostola triplasia</i> (L.)	Not common.
<i>A. tripartita</i> (Hufn.)	Common.
<i>Euclidimera mi</i> (Cl.)	Fairly common by day in Chase Wood.
<i>Catocala nupta</i> (L.)	A few taken at sugar.
<i>Ophiusa (Lygephila) pastinum</i>	
	(Treit.)
<i>Zanclognatha tarsipennalis</i> (Treit.)	One at light, July, 1956.
<i>Z. (grisealis) nemoralis</i> (F.)	Common.
<i>Laspeyria flexula</i> (Schiff.)	Fairly common.
<i>Bomolocha (crassalis) fontis</i>	One in 1953 and four in 1954 at light.
	(Thunb.)
<i>Hypena proboscidalis</i> (L.)	Two in Penyard Park Wood, 1951, and two at light, 1953.
<i>H. rostralis</i> (L.)	Common.
<i>Schränkia costaestrigalis</i> (Steph.)	Fairly common. Hibernates in upper floor of outbuildings.
<i>Episema caeruleocephala</i> Linn.	One at light, 1955.
	Very common.

BREPHIDAE

<i>Brephos (Archiearis) parthenias</i> (L.)	One in Chase Wood and one in garden.
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GEOMETRIDAE

<i>Pseudoterpnia pruinata</i> (Hufn.)	One at light, 1952.
<i>Geometra papilionaria</i> (L.)	One flushed in Penyard Park Wood and one at light in garden.
<i>Hemistola immaculata</i> (Thunb.)	A female to light in 1951.
<i>Comibaena pustulata</i> (Hufn.)	Six or eight at light.
<i>Jodis lactearia</i> (L.)	Common.
<i>Hemithea aestivaria</i> strigata	(Müll.) Very common.

STERRHIDAE

<i>Sterrha (seriata) virgularia</i> (Hb.)	Common.
<i>S. fuscovenosa</i> (Goeze)	Fairly common.
<i>S. subsericeata</i> (Haw.)	Only three taken.
<i>S. emarginata</i> (L.)	Not common.
<i>S. aversata</i> (L.)	Very common.
<i>S. biselata</i> (Hufn.)	Very common.
<i>S. dimidiata</i> (Hufn.)	" "
<i>S. trigeminata</i> (Haw.)	" "
<i>Scopula (floslacta) remutaria</i> (Hb.)	Common.
<i>S. imitaria</i> (Hb.)	" "
<i>Calothysanis amata</i> (L.)	Very common.
<i>Cosymbia porata</i> (F.)	Two at light.
<i>C. punctaria</i> (L.)	Common.
<i>C. (linearia) trilinearia</i>	(Borkh.) One larva beaten, Chase Wood.
<i>C. albipunctata</i> (Hufn.)	One at rest, Chase Wood.

HYDRIOMENIDAE

<i>Rhodometra sacraria</i> (L.)	One in 1947 and fourteen in 1949.
<i>Minoa murinata</i> (Scop.)	Fairly common in Chase Wood.
<i>Ortholitha (chenopodiata) limitata</i>	Common.
	(Scop.)
<i>Larentia (clavaria) cervicalis</i> (Scop.)	Three specimens taken.
<i>Anaitis plagiata</i> (L.)	Fairly common.
<i>Chesias legatella</i> (Schiff.)	" "
<i>C. rufata</i> (F.)	Four specimens taken.
<i>Trichopteryx (Nothopteryx) carpinata</i> (Borkh.)	Fairly common.
<i>Acasis viretata</i> (Hb.)	Three at light in 1951.
<i>Lobophora halterata</i> (Hufn.)	One at light in 1953.
<i>Triphosia dubitata</i> (L.)	Fairly common.
<i>Calocalpe cervicalis</i> (Scop.)	One at rest, 1949, and one at light, 1950.
<i>C. undulata</i> (L.)	One at light, 1951.
<i>Eulype hastata</i> (L.)	A few found flying by day in Penyard Park Wood, 1953.
<i>Ecliptoptera silacea</i> (Schiff.)	Common.
<i>Lygris prunata</i> (L.)	One taken in 1955.
<i>L. mellinata</i> (F.)	One or two each year.
<i>L. (pyraliata) dotata</i> (L.)	Fairly common.
<i>Cidaria fulvata</i> (Forst.)	" "
<i>Electrophaes corylata</i> (Thunb.)	Common.
<i>Dysstroma truncata</i> (Hufn.)	Very common.
<i>D. citrata</i> (L.)	Common.
<i>Lampropteryx suffumata</i> (Schiff.)	Common.

<i>Lyncometra ocellata</i> (L.)	Not common.
<i>Chloroclysta siterata</i> (Hufn.)	Common.
<i>Plemyria bicolorata</i> (Hufn.)	Not common.
<i>Thera obeliscata</i> (Hb.)	Fairly common.
<i>T. variata</i> (Schiff.)	Common.
<i>T. firmata</i> (Hb.)	Fairly common.
<i>Xanthorhoe ferrugata</i> (Cl.)	Very common.
<i>X. spadicearia</i> (Schiff.)	" "
<i>X. montanata</i> (Schiff.)	Very common.
<i>X. fluctuata</i> (L.)	Common.
<i>Epirrhoë rivata</i> (Hb.)	Very common.
<i>E. alternata</i> (Müll.)	Very common.
<i>Calostigia pectinataria</i> (Knoch)	Fairly common.
<i>C. multistrigaria</i> (Haw.)	Not common.
<i>C. didymata</i> (L.)	Two taken in 1949, and two in 1956.
<i>Euphyia unangulata</i> (Haw.)	Not common.
<i>E. picata</i> (Hb.)	" "
<i>E. bilineata</i> (L.)	Very common.
<i>Mesoleuca albicillata</i> (L.)	Fairly common.
<i>Melanthis procellata</i> (Schiff.)	" "
<i>Europhila badiata</i> (Schiff.)	Common.
<i>Coenotephria (Anticlea) derivata</i>	Fairly common.
	(Schiff.)
<i>Perizoma affinitata</i> (Steph.)	Very common.
<i>P. alchemillata</i> (L.)	Fairly common.
<i>P. flavofasciata</i> (Thunb.)	" "
<i>P. albulata</i> (Schiff.)	Very common.
<i>P. bifaciata</i> (Haw.)	One at <i>Buddleia</i> bloom, 1948.
<i>Hydriomena furcata</i> (Thunb.)	Very common.
<i>Euchoea (nebulata) oblitterata</i>	One taken Coughton Marsh, 1951.
	(Hufn.)
<i>Asthena albulata</i> (Hufn.)	Not common.
<i>Hydrelia flammearia</i> (Hufn.)	" "
<i>Operophtera brumata</i> (L.)	Definitely occurs; probably often confused with preceding species.
<i>O. fagata</i> (Scharf.)	Very common.
<i>Operinia dilutata</i> (Schiff.)	Fairly common.
<i>Eupithecia centaureata</i> (Schiff.)	Very common.
<i>E. pulchellata</i> Steph.	One taken at light, 1952.
<i>E. tantillaria</i> Boisd.	Fairly common.
<i>E. indigata</i> (Hb.)	One only taken in garden.
<i>E. assimilata</i> Guenée	Common.
<i>E. absinthiata</i> (Cl.)	One at light, 1950 and 1951.
<i>E. (tripunctaria) albipunctata</i>	Very common.
	(Haw.)
<i>E. vulgata</i> (Haw.)	" "
<i>E. lariciata</i> Freyer	" "
<i>E. castigata</i> (Hb.)	Common.
<i>E. icterata</i> (Vill.)	Not common.
<i>E. (haworthiata) isogrammaria</i>	One at light, 1949 and 1954.
	(H-S.)
<i>E. plumbeolata</i> (Haw.)	Very common.
<i>E. tenuiata</i> (Hb.)	One at light, 1951.
<i>E. nanata</i> (Hb.)	Very common.
<i>E. abbreviata</i> Steph.	Very common.
<i>E. dodoneata</i> Guen.	Common.
<i>E. exigua</i> (Hb.)	One at light, 1950.
<i>Eucymatoge (Eupithecia) subnotata</i>	Fairly common.
	(Hb.)

<i>Gymnoscelis pumilata</i> (Hb.)	Common.
<i>Chloroclystis coronata</i> Hb.	"
<i>C. rectangulata</i> (L.)	"
<i>Horisme vitalbata</i> (Schiff.)	A female taken in Penyard Park Wood, 1953.
<i>H. tersata</i> (Schiff.)	One flushed Howle Hill, 1948, and one at light, 1951.
<i>Nycterosea obstipata</i> (F.)	One to light, 28th July, 1947.

SELIDOSEMIDAE

<i>Abraxas sylvata</i> (Scop.)	Common in parts of Chase Wood and occasionally comes to light.
<i>A. grossulariata</i> (L.)	Common.
<i>Lomaspilis marginata</i> (L.)	Fairly common.
<i>Ligdia adustata</i> (Schiff.)	Common.
<i>Bapta (temerata) punctata</i> (F.)	"
<i>Cabera pusaria</i> (L.)	"
<i>C. exanthemata</i> (Scop.)	Not common.
<i>Plagodis dolabraria</i> (L.)	"
<i>Anagoga pulveraria</i> (L.)	Two flushed in Penyard Park Wood, 1953.
<i>Elloptia (fasciaria) prosapiaria</i> (L.)	A female taken at light, 1954.
<i>Campea margaritata</i> (L.)	Common.
<i>Ennomos quercinaria</i> (Hufn.)	Fairly common.
<i>Deuteronomos alniaria</i> (L.)	Common.
<i>D. fuscantaria</i> (Haw.)	=
<i>D. erosaria</i> (Schiff.)	"
<i>Selenia bilunaria</i> (Esp.)	"
<i>S. lunaria</i> (Schiff.)	One at rest Chase Wood, 1948, and one female at light, 1954.
<i>S. tetralunaria</i> (Hufn.)	Fairly common.
<i>Hygrochroa (Apeira) syringaria</i> (L.)	"
<i>Gonodontis bidentata</i> (Cl.)	Common.
<i>Colotois pennaria</i> (L.)	"
<i>Crocallis elinguaria</i> (L.)	"
<i>Ourapteryx sambucaria</i> (L.)	"
<i>Opisthograptis luteolata</i> (L.)	Very common.
<i>Epione repandaria</i> (Hufn.)	Fairly common.
<i>Pseudopanthera macularia</i> (L.)	Very common, Chase and Penyard Park Woods.
<i>Lithina chlorosata</i> (Scop.)	Very common.
<i>Semiothisa liturata</i> (Cl.)	Common.
<i>Itama wauaria</i> (L.)	One at light, 1949 and 1954.
<i>Chiasmia clathrata</i> (L.)	Fairly common in Chase Wood.
<i>Theria rupicapraria</i> (Schiff.)	Fairly common.
<i>Erannis leucophaearia</i> (Schiff.)	Common.
<i>E. aurantaria</i> (Esp.)	Fairly common.
<i>E. (marginaria) progemmaria</i> (Hb.)	Very common.
<i>E. defoliaria</i> (Cl.)	"
<i>Alsophila aescularia</i> (Schiff.)	Common.
<i>Phigalia (pedaria) pilosaria</i> (Schiff.)	,, including ab. <i>monacharia</i> .
<i>Apocheima hispidaria</i> (Schiff.)	Common.
<i>Biston strataria</i> (Hufn.)	"
<i>B. betularia</i> (L.)	Very common, including melanic forms.
<i>Hemerophila abruptaria</i> (Thunb.)	Fairly common.
<i>Cleora (Alcis) rhomboidaria</i> (Schiff.)	Common.

<i>C. repandata</i> (L.)	Very common, two ab. <i>conversaria</i> taken.
<i>Ectropis bistortata</i> (Goeze)	Common.
<i>E. crepuscularia</i> (Hb.)	"
<i>E. (extersaria) luridata</i> (Borkh.)	One at light, 1952 and 1956, one larva beaten Chase Wood, 1954.
<i>E. consonaria</i> (Hb.)	Fairly common.
<i>Ectropis (Aethalura) punctulata</i> (Schiff.)	Common.
<i>Bupalus piniaris</i> (L.)	Abundant in Scots Pine plantation, Chase Wood.

ZYGAENIDAE

<i>Zygaena trifolii</i> (Esp.)	A colony in Coughton Marsh.
<i>Z. lonicerae</i> (Schev.)	ditto.

COSSIDAE

<i>Zeuzera pyrina</i> (L.)	Not common.
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SESIIDAE

<i>Sphecia bembeiformis</i> (Hb.)	One reared from larva removed from sa'ow, Coughton Marsh, 1951.
<i>Aegeria vespiformis</i> (L.)	One reared from larva removed from oak stump, Penyard Park Wood, 1953.

HEPIALIDAE

<i>Hepialus humuli</i> (L.)	Apparently not common.
<i>H. lupulinus</i> (L.)	Very common.
<i>H. hectus</i> (L.)	Quite common in Chase Wood.

Total number of species: 404.

I am grateful to Mr. W. H. T. Tams, of the British Museum (Natural History) for identifying a number of specimens including *Procus* species, and to the Editors of this journal for assistance in nomenclature, also to Mr. H. D. Swain for his Putney list (1952 *Ent. Gaz.* 3:109) on which this is modelled.

The nomenclature follows that of Kloet and Hincks, 1945.

AMARA ANTHOBIA VILLA IN HUNTINGDON
(COLEOPTERA: CARABIDAE)

A single specimen of *Amara anthobia* Villa was taken under sedge refuse at Wood Walton Fen on 23rd September, 1956, and constitutes a new record for the County. On this collecting trip I was privileged to accompany Dr. J. L. Newton and Messrs. F. D. Buck and R. D. Weal, who are carrying out an entomological survey for the Nature Conservancy. I am indebted to Dr. B. P. Moore for the determination.

29 Glenfield Road,
Banstead, Surrey.

A. E. GARDNER.

HYDRAECIA PETASITIS (DOUBL.) IN
BERKSHIRE
(LEP: CARADRINIDAE)

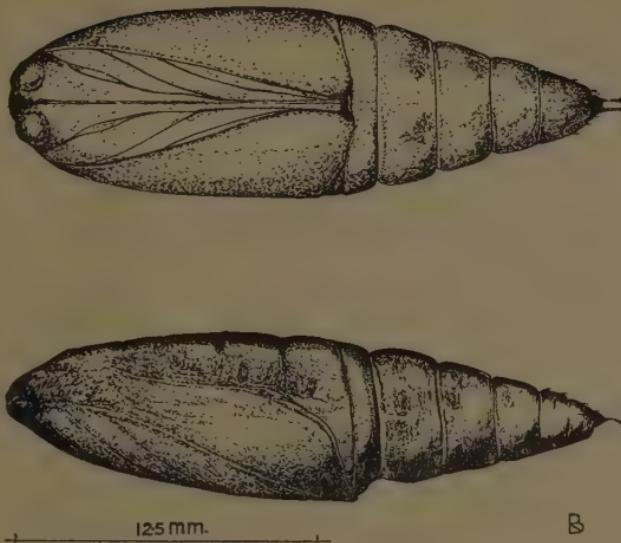
By B. R. BAKER, B.Sc.

The Butterbur moth has been known to occur in our district for many years, yet apart from a brief mention as 'rare—Newbury district' in the Victoria County History and an A.E.S. note of a worn specimen taken near Reading in 1943, I have been unable to find further mention of the species. The joint collection in the Reading Museum of Messrs. Cocks, Dolton and Holland seemed a likely place to find a few preserved specimens, particularly as Holland collected actively at the time that Miss Kimber's V.C.H. record was published (1906), but no local *petasitis* came to notice during the search.

The foodplant of this retiring moth (*Petasitis vulgaris*) is to be found in some abundance along the Kennet banks between Reading and Newbury, large patches of the plant occurring in several sections of the river.

On the afternoon of 26th July I settled down by one of these large patches and attempted to dig for pupae. It was a blazing hot day (one of few) and working systematically along the bank was warm work, but evidence of larval tunnels was not long in forthcoming. From that moment it was just a case of keeping at it, and after about an hour's work a dark brown pupa was turned up in the peaty soil. It was of the dimensions one might expect for *petasitis*, and efforts were renewed in the hope of finding a fully-grown larva, but after a further two hours no other pupae had been found, and the large larva which had wriggled out of a fresh tunnel in a butterbur runner certainly didn't agree with Buckler's description of the species. This particular larva was an inch and a half long, dull white in colour, with head and prothoracic segment brown. Slightly raised warts, orange in colour bore short blackish hairs (a single hair per wart and four warts per segment dorsally). It was certainly not the black dotted larva for which I was searching and presumably can only have been a first year *Heptialus humuli* (L.). Three hours digging on an afternoon such as this was quite enough, and I returned home with the solitary pupa. Examining it later in the day the cremaster was found to be in the form of two parallel spines, each about a millimetre in length, an easily recognizable feature to tie up with future finds, and the pupa itself had an overall length of 25 mm.

The wing cases of the pupa began to pigment on 6th August, and I was fortunate enough to be observing it when it split open at 9.40



Hydraecia petasitis. Doubt.
Pupa-ventral and lateral views.

p.m. on 9th August. The moth *ran* out of the pupal case and climbed a piece of butterbur root placed in the cage. At 10.00 hours it raised its wings over its back, keeping them in this position until 10.30 p.m., when the normal resting attitude was assumed. The hoped-for identity of the moth was now proved and this *petasitis*, as may be imagined from the date of emergence, was a male.

On 12th August a further three hours' work brought one more pupa to light, and again this example was found in the soft peaty soil close to a butterbur runner and within a foot of the water's edge. Examination of the cremaster through a pocket lens left no doubt as to the identity of this second example. At the end of this particular week I again tried gardening by the river bank (18th August) but was unable to reach the locality until evening and had to continue operations in thunder-storm conditions to make the most of the remaining light. At dusk I gave up digging, having drawn a complete blank, and was enjoying a quiet pipe by the water's edge when *petasitis* suddenly appeared buzzing slowly around the large leaves of the foodplant. The net was still packed away in the rucksack a hundred yards down the river bank, and although I attempted to box the moth which was now crawling about the undersurface of the leaves, it was a hopeless proposition. *Petasitis* was off downstream in no uncertain manner. Another specimen appeared and I hurried to rig up the net, but by now it was dark and not having prepared to work light on this particular night, I

left for home. During the next few days I waited for a good weather forecast so that dusking for adults could be attempted. Meanwhile the second pupa produced a fine female on 20th August. The hoped-for weather conditions came on 22nd August, and as I drove down the Bath Road at seven o'clock that evening a fine drizzle set in. This, along with good cloud cover and the thermometer high, promised a good night. A three-foot handle was fixed to the net, the pressure lamp started just before dusk, and I set off walking slowly along the river bank well amongst the butterbur plants. At 8.45 p.m. noctuids were very active, and during the next quarter of an hour three *petasitis* were netted as they flew across the rays of the lamp. The flight appeared very brief, and no specimens were seen after nine o'clock, neither were any found at rest under the large leaves of butterbur.

On 26th August I again visited the locality to try further dusking, but the temperature was down almost to forty degrees and it didn't appear very hopeful. A piece of root was needed for the supposed *humuli* larva and I attended to this immediately on arrival at the river bank. At the very first thrust of the trowel up came an empty pupa case, and on looking closer I saw that I had completely severed the abdomen of a *petasitis* which had been making its way to the surface from four inches or so underground. Later that night a single *petasitis* was netted, and again this example was taken between 8.45 and 9 p.m. Very few moths were on the wing on this particular evening, but it was interesting to see that caddis adults were active in spite of the low temperature. Several *Limnephilus rhombicus* (L.) and *Potamophylax stellatus* (Curt.) were taken from the flowering heads of *Eupatorium cannabinum* which I had been examining in the hope of finding *Plusia festucae* (L.)—an uncommon moth in Berkshire.

From the foregoing account *petasitis* would appear to be well established along the Kennet in Berkshire, but it is a difficult moth to come by. We have worked the valley over a number of years, often with mercury vapour light, but have never had the moth attracted to the sheets. Even so, the short series of the moth in the cabinet, comprising bred and caught specimens, leaves no doubt that caught *petasitis* are poor representations of the moth (more so than with other moths), and therefore recourse to pupa digging is worth while. The hours of digging mentioned in this account may seem excessive for the yield of pupae, but I had been operating within a foot or two of the water's edge, and perhaps plants in a somewhat drier situation would have given better results. The only other pupa encountered during digging was that of *Amathes xanthographa* (Schiff.). This is immediately recognizable from that of *petasitis* by its small size (17 mm. as against 25 mm.); further, the cremaster of *xanthographa* is in the form of two diverging spikes, not parallel processes as in *petasitis*.

THE BRITISH CARABIDAE (COLEOPTERA), PART I: A CHECK LIST OF THE SPECIES

By B. P. MOORE, D.Phil., F.R.E.S.

The most recent list of the British Carabidae is that given by Kloet and Hincks (1945) in their standard work on the insect fauna of our islands. This list, which includes three hundred and forty-four species, was based upon that of Andrewes (1939) and is now somewhat out of date. Five species (*Nebria nivalis* (Payk.) (Blair, 1950); *Badister anomalus* (Per.) (Kevan, 1955); *Perigona migriceps* (Dej.), *Amara montivaga* (Sturm) (Allen, 1950); and *Amara cursitans* Zimm. (Allen, 1956)) have since been added, two species (*Bembidion dalmatinum* Dej. (Mackechnie-Jarvis, 1946) and *Harpalus subquadratus* Dej. (Moore, 1956a)) have been deleted, and a number of changes of status have been made for other forms. Moreover, the nomenclature adopted by these authors is widely at variance with that generally employed abroad—a most undesirable state of affairs! Since it is my intention to publish, as part of this series, a summary of the recorded distribution of our Carabidae, I have felt obliged to undertake the compilation of a revised list.

During the course of the revision, I have corrected many errors present in the earlier lists (some of which had already been acknowledged; see Bayford, 1944, and Blair, 1945), but since it has not been possible to check every citation against the original reference, others may still remain. I have also endeavoured to take account of all subsequently published nomenclatorial changes. However, the most serious problem has concerned the treatment to be accorded to Bonelli's generic names. I have already outlined (Moore, 1956b) the reasons which led Andrewes (1919) to reject these long-established names and the arguments which other authors have advanced in favour of their retention (e.g., see Gaskin and Lewis, 1956), and I do not propose to dwell further upon the matter. Suffice it is to say that after lengthy consideration, I have elected to restore these names wherever applicable.

The new check list includes some species of slender claim to 'British status'; these have been left unnumbered, and they include, besides casual importations and immigrants, several species, formerly indigenous, but which have become very rare or extinct in recent years. The more important varieties are also listed and where they alone represent a given species in the British Isles, the citation of the type form is included in square brackets. Subgenera have been omitted as being of limited interest in so restricted a fauna; synonyms, where given, are printed in *italics*.

It is a pleasure to record that I have benefited greatly from correspondence with Mr. A. A. Allen, whose wide knowledge of the British Coleoptera has been of much assistance during the compilation of this list.

CARABIDAE

CICINDELINAE

Cicindela Linnaeus 1758
 1 *svylvatica* Linnaeus 1758
 2 *hybrida* Linnaeus 1758
 3 *maritima* Dejean 1825
 4 *campestris* Linnaeus 1758
 5 *germanica* Linnaeus 1758

CARABINAE

Calosoma Weber 1801
 6 *inquisitor* (Linnaeus 1758)
 — *sycophanta* (Linnaeus 1758)
Carabus Linnaeus 1758
 7 *monilis* Fabricius 1792
 v. *gracilis* Küster 1846
consitus auct. *nec* Panzer 1796
 8 *[arvensis* Herbst 1784]
 ssp. *silvaticus* Dejean 1826
 9 *granulatus* Linnaeus 1758
 ssp. *hibernicus* Lindroth 1956
 10 *[clathratus* Linnaeus 1761]
 ssp. *jansoni* Kraatz 1890
 11 *nemoralis* Müller 1764
 12 *[glabratus* Paykull 1790]
 v. *lapponicus* Born 1908
 13 *[problematicus* Herbst 1786]
 ssp. *gallicus* Géhin 1885
catenulatus auct. *nec* Scopoli
 1763
 14 *nitens* Linnaeus 1758
 15 *intricatus* Linnaeus 1761

16 *[violaceus* Linnaeus 1758]

v. *sollicitans* Hartert 1907

v. *asperipennis* Lapouge 1921

— *auratus* Linnaeus 1761

— *cancellatus* Illiger 1798

Cychrus Fabricius 1794

17 *[caraboides* (Linnaeus 1758)]

v. *rostratus* (Linnaeus 1761)

Leistus Frölich 1799

18 *spinibarbis* (Fabricius 1775)

19 *montanus* Stephens 1827

20 *rufomarginatus* (Duftschmid
 1812)

21 *fulvibarbis* Dejean 1826

22 *rufescens* (Fabricius 1775)

terminatus (Hellwig 1793)

23 *ferrugineus* (Linnaeus 1758)

Eurynebria Ganglbauer 1891

24 *complanata* (Linnaeus 1767)

Nebria Latreille 1802

25 *brevicollis* (Fabricius 1792)

26 *salina* Fairmaire & Laboulbène
 1854

iberica Oliveira 1876

degenerata Schaufuss 1862

27 *rufescens* (Ström 1768)

v. *gyllenhali* (Schönherr 1806)

v. *balbii* Bonelli 1810

28 *nivalis* (Paykull 1798)

29 *[livida* (Linnaeus 1758)]

v. *lateralis* (Fabricius 1792)

Pelophila Dejean 1826
 30 borealis (Paykull 1790)

Notiophilus Duméril 1806
 31 aestuans Motschoulsky 1864
 32 aquaticus (Linnaeus 1758)
 33 germinyi Fauvel 1863
hypocrita Putzeys 1866
 34 palustris Duftschmid 1812
 35 substriatus Waterhouse 1833
 36 rufipes Curtis 1829
 37 biguttatus (Fabricius 1779)
 38 quadripunctatus Dejean 1826

Blethisa Bonelli 1810
 39 multipunctata (Linnaeus 1758)

Elaphrus Fabricius 1775
 40 lapponicus Gyllenhal 1810
 41 uliginosus Fabricius 1775
 42 cupreus Duftschmid 1812
 43 riparius (Linnaeus 1758)

Loricera Latreille 1802
 44 pilicornis (Fabricius 1775)

Clivina Latreille 1802
 45 fossor (Linnaeus 1758)
 46 collaris (Herbst 1784)

Dyschirius Bonelli 1810
 47 arenosus Stephens 1827
 48 obscurus Gyllenhal 1827
 49 nitidus (Dejean 1825)
 50 politus (Dejean 1825)
 51 impunctipennis Dawson 1854
 52 extensus Putzeys 1845
 53 salinus Schaum 1843
 54 aeneus (Dejean 1825)
 55 lüdersi Wagner 1915
 56 angustatus (Ahrens 1830)
 57 globosus (Herbst 1783)

HARPALINAE

Broscus Panzer 1813
 58 cephalotes (Linnaeus 1758)

Miscodera Eschscholtz 1830
 59 arctica (Paykull 1798)

Asaphidion Des Gozis 1886
 60 pallipes (Duftschmid 1812)
 61 flavipes (Linnaeus 1761)

Bembidion Latreille 1802
 62 argentiolum Ahrens 1812
 63 litorale (Olivier 1791)
 64 nigrorne Gyllenhal 1827
 65 lampros (Herbst 1784)
 66 properans Stephens 1828
 67 punctulatum Drapiez 1820
 68 pallidipenne (Illiger 1801)
 69 bipunctatum (Linnaeus 1761)
 70 dentellum (Thunberg 1787)
 71 varium (Olivier 1795)
 72 obliquum Sturm 1825
 73 semipunctatum Donovan 1806
adustum Schaum 1860
 74 ephippium (Marsham 1802)
 75 prasinum (Duftschmid 1812)
 76 virens Gyllenhal 1827
 77 tibiale (Duftschmid 1812)
 78 geniculatum Heer 1837
redtenbacheri K. Daniel 1902
 79 atrocoeruleum Stephens 1828
 80 monticola Sturm 1825
 81 nitidulum (Marsham 1802)
 82 stephensi Crotch 1869
 83 lunatum (Duftschmid 1812)
 84 bruxellense Wesmael 1835
rupestre auct.

85 <i>maritimum</i> Stephens 1835	114 <i>unicolor</i> Chaudoir 1850
<i>concinnum</i> Fowler <i>nec</i> Stephens 1828	<i>mannerheimi</i> Sahlberg <i>nec</i> Dejean 1831
86 <i>tetracolum</i> Say 1823 <i>ustulatum</i> auct.	115 <i>guttula</i> (Fabricius 1792)
87 <i>femoratum</i> Sturm 1825	116 <i>lunulatum</i> (Fourcroy 1785)
88 [<i>andreae</i> (Fabricius 1787)]	117 <i>iricolor</i> Bedel 1879
ssp. <i>bualei</i> Duval 1852	 Tachys Stephens 1828
89 <i>saxatile</i> Gyllenhal 1827	118 <i>bistriatus</i> (Duftschmid 1812)
90 <i>testaceum</i> (Duftschmid 1812)	119 <i>edmondsi</i> Moore 1956
91 <i>fluvatile</i> Dejean 1831	<i>piceus</i> Edmonds <i>nec</i> Dalla Torre 1877
92 <i>decorum</i> (Panzer 1801)	120 <i>micros</i> (Fischer-Waldheim 1828)
— <i>callosum</i> Küster 1847	121 <i>scutellaris</i> Stephens 1828
93 [<i>genei</i> Küster 1847]	— <i>bisulcatus</i> (Nicolai 1822)
ssp. <i>illigeri</i> Netolitzky 1914	122 <i>parvulus</i> (Dejean 1831)
94 <i>atroviolaceum</i> Dufour 1820	123 <i>walkerianus</i> Sharp 1913
95 <i>nigropiceum</i> (Marsham 1802)	— <i>quadrisignatus</i> (Duftschmid 1812)
96 <i>laterale</i> (Samouelle 1819)	 Perileptus Schaum 1860
97 <i>schüppeli</i> Dejean 1831	124 <i>aerolatus</i> (Creutzer 1799)
98 <i>gilvipes</i> Sturm 1825	 Aeopopsis Jeannel 1922
99 <i>fumigatum</i> (Duftschmid 1812)	125 <i>robinii</i> (Laboulbène 1849)
100 <i>assimile</i> Gyllenhal 1810	 Aepus Samouelle 1819
101 <i>clarki</i> Dawson 1849	126 <i>marinus</i> (Ström 1788)
102 <i>normannum</i> Dejean 1831	 Thalassophilus Wollaston 1854
103 <i>minimum</i> (Fabricius 1792)	127 <i>longicornis</i> (Sturm 1825)
104 <i>quadripustulatum</i> Serville 1821	 Trechus Clairville 1806
105 <i>quadrimaculatum</i> (Linnaeus 1761)	128 <i>secalis</i> (Paykull 1790)
106 <i>doris</i> (Panzer 1797)	129 <i>rivularis</i> (Gyllenhal 1810)
107 <i>articulatum</i> (Panzer 1796)	130 <i>subnotatus</i> Dejean 1831
108 <i>octomaculatum</i> (Goeze 1777)	131 <i>quadristriatus</i> (Schrank 1781)
109 <i>obtusum</i> Serville 1821	<i>minutus</i> (Fabricius 1801)
110 <i>harpaloides</i> Serville 1821	132 <i>obtusus</i> Erichson 1837
111 <i>quinquestriatum</i> Gyllenhal 1810	133 <i>rubens</i> (Fabricius 1792)
112 <i>biguttatum</i> (Fabricius 1779)	134 <i>fulvus</i> Dejean 1831
113 <i>aeneum</i> Germar 1824	

Lasiotrechus Ganglbauer 1892 135 <i>discus</i> (Fabricius 1801)	Perigona Castelnau 1834 159 <i>nigriceps</i> (Dejean 1831)
Trechoblemus Ganglbauer 1892 136 <i>micros</i> (Herbst 1784)	Harpalus Latreille 1802 160 <i>affinis</i> (Schrank 1781) <i>aeneus</i> (Fabricius 1792)
Pogonus Nicolai 1822 137 <i>luridipennis</i> (Germar 1822)	161 <i>cupreus</i> Dejean 1829 162 <i>smaragdinus</i> (Duftschmid 1812)
138 <i>litoralis</i> (Duftschmid 1812)	163 <i>dimidiatus</i> (Rossi 1790)
139 <i>chalceus</i> (Marsham 1802)	164 <i>melancholicus</i> Dejean 1829 165 <i>tenebrosus</i> Dejean 1829
Patrobus Stephens 1827 140 <i>septentrionis</i> Dejean 1828	166 <i>latus</i> (Linnaeus 1758) 167 <i>quadripunctatus</i> Dejean 1829
141 <i>assimilis</i> Chaudoir 1844	168 <i>rubripes</i> (Duftschmid 1812)
142 <i>atrorufus</i> (Ström 1768) <i>excavatus</i> (Paykull 1790)	169 <i>rufitarsus</i> (Duftschmid 1812) — <i>honestus</i> (Duftschmid 1812)
Panagaeus Latreille 1804 143 <i>crux-major</i> (Linnaeus 1758)	170 <i>attenuatus</i> Stephens 1828 171 <i>neglectus</i> Serville 1821
144 <i>bipustulatus</i> (Fabricius 1775)	172 <i>serripes</i> (Quensel 1806) 173 <i>tardus</i> (Panzer 1797)
Callistus Bonelli 1810 145 <i>lunatus</i> (Fabricius 1775)	174 <i>servus</i> (Duftschmid 1812) 175 <i>frölichi</i> Sturm 1818
Chlaenius Bonelli 1810 146 <i>tristis</i> (Schaller 1783)	176 <i>anxius</i> (Duftschmid 1812) 177 <i>picipennis</i> (Duftschmid 1812)
147 <i>nigricornis</i> (Fabricius 1787)	178 <i>sabulicola</i> (Panzer 1796) 179 <i>obscurus</i> (Fabricius 1792)
148 <i>nitidulus</i> (Schrank 1781)	180 <i>ardosiacus</i> Lutschnik 1922 <i>rotundicollis</i> auct. britt.
149 <i>vestitus</i> (Paykull 1790)	181 <i>punctatulus</i> (Duftschmid 1812) 182 <i>azureus</i> (Fabricius 1775)
Oodes Bonelli 1810 150 <i>helopoides</i> (Fabricius 1792)	183 <i>puncticeps</i> Stephens 1828 <i>angusticollis</i> Müller 1921
Badister Clairville 1806 151 <i>unipustulatus</i> Bonelli 1813	<i>rectangulus</i> Sharp 1912
152 <i>bipustulatus</i> (Fabricius 1792)	184 <i>puncticollis</i> (Paykull 1798)
153 <i>sodalis</i> (Duftschmid 1812)	
154 <i>peltatus</i> (Panzer 1796)	
155 <i>anomalus</i> (Perris 1866)	
156 <i>dilatatus</i> Chaudoir 1837	
Licinus Latreille 1802 157 <i>punctatulus</i> (Fabricius 1792)	
158 <i>depressus</i> (Paykull 1790)	

185 *melleti* Heer 1837
rupicoloides Sharp 1912
v. zigzag Costa 1882
parallelus Sharp, 1912
186 *brevicollis* Serville 1821
championi Sharp 1912
187 *subpunctatus* Stephens 1828
seladon Schuberger 1926
brevicollis Sharp 1912
188 *schaubergerianus* Puel 1937
rufibarbis Sharp 1912
189 *rupicola* Sturm 1818
190 *cordatus* (Duftschmid 1812)
— *calceatus* (Duftschmid 1812)
191 *rufipes* (Degeer 1774)
pubescens (Müller 1776)
Stenolophus Stephens 1827
192 *teutonus* (Schrank 1781)
— *abdominalis* Gené 1836
193 *skrimshiranus* Stephens 1828
194 *mixtus* (Herbst 1784)
195 *plagiatus* Gorham 1901
discophorus auct. europ.
Acupalpus Latreille 1829
196 *elegans* Dejean 1829
197 *flavicollis* (Sturm 1825)
198 *brunneipes* (Sturm 1825)
199 *meridianus* (Linnaeus 1767)
200 *dorsalis* (Fabricius 1787)
derelictus (Dawson 1854)
201 *dubius* Schilsky 1888
luridus auct. *nec* Dejean 1829
202 *exiguus* Dejean 1829
Anthracus Motschoulsky 1850
203 *consputus* (Duftschmid 1812)

Bradyceillus Erichson 1837
204 *ruficollis* (Stephens 1828)
205 *distinctus* (Dejean 1829)
206 *sharpi* Joy 1912
distinctus Fowler *nec* Dejean
1829
207 *verbasci* (Duftschmid 1812)
208 *harpalinus* (Serville 1821)
209 *collaris* (Paykull 1798)
Trichocellus Ganglbauer 1892
210 *cognatus* (Gyllenhal 1827)
211 *placidus* (Gyllenhal 1827)
Dicheirotrichus Duval 1857
212 *gustavi* Crotch 1870
pubescens (Paykull) *nec*
(Müller 1776)
213 *obsoletus* (Dejean 1829)
Diachromus Erichson 1837
— *germanus* (Linnaeus 1758)
Scybalicus Schaum 1862
214 *oblongiusculus* (Dejean 1829)
Anisodactylus Dejean 1829
215 *poeciloides* (Stephens 1828)
216 *binotatus* (Fabricius 1787)
v. spurcaticornis Dejean 1829
217 *nemorivagus* (Duftschmid 1812)
v. atricornis (Stephens 1835)
Amara Bonelli 1810
218 *strenua* Zimmermann 1831
219 *plebeja* (Gyllenhal 1810)
220 *similata* (Gyllenhal 1810)
221 *ovata* (Fabricius 1792)
222 *montivaga* (Sturm 1825)
223 *nitida* (Sturm 1825)
224 *communis* (Panzer 1797)
v. convexior Stephens 1828

225 *lunicollis* Schiödte 1837
vulgaris auct.

226 *curta* Dejean 1828

227 *aenea* (Degeer 1774)

228 *spreta* Dejean 1831

229 *famelica* Zimmermann 1831

230 *eurynota* (Panzer 1797)

231 *familiaris* (Duftschmid 1812)

232 *anthobia* Villa 1833

233 *lucida* (Duftschmid 1812)

234 *tibialis* (Paykull 1798)

235 [*complanata* Dejean 1828]
 v. *fusca* Dejean 1828

— *cursitans* Zimmermann 1831

236 *quenseli* (Schönherr 1806)

237 *bifrons* (Gyllenhal 1810)

238 *praetermissa* (Sahlberg 1827)

239 *infima* (Duftschmid 1812)

240 *apricaria* (Paykull 1790)

241 *fulva* (Degeer 1774)

242 *consularis* (Duftschmid 1812)

243 *aulica* (Panzer 1797)

244 *convexuscula* (Marsham 1802)

245 *alpina* (Paykull 1790)

246 *equestris* (Duftschmid 1812)

Zabrus Clairville 1806

247 *tenebrioides* (Goeze 1777)

Stomis Clairville 1806

248 *pumicatus* (Panzer 1796)

Pterostichus Bonelli 1810

249 *kugelanni* (Panzer 1797)
dimidiatus (Olivier 1795)

250 *lepidus* (Leske 1785)

251 *cupreus* (Linnaeus 1758)

252 *caerulescens* (Linnaeus 1758)

253 *longicollis* (Duftschmid 1812)
inaequalis (Marsham)
nec (Panzer 1796)

254 *vernalis* (Panzer 1796)

255 *macer* (Marsham 1802)

256 *aterrimus* (Herbst 1784)

257 *adstrictus* Eschscholtz 1823

258 *oblongopunctatus* (Fabricius 1787)

259 *angustatus* (Duftschmid 1812)

260 *niger* (Schaller 1783)
 ssp. *scotum* Jeannel 1942

261 *melanarius* (Illiger 1798)
vulgaris auct.

262 *nigrita* (Fabricius 1792)

263 *anthracinus* (Illiger 1798)

264 *gracilis* Dejean 1828

265 *minor* Gyllenhal 1827

266 *strenuus* (Panzer 1797)

267 *diligens* Sturm 1824

268 *aethiops* (Panzer 1797)

269 *madidus* (Fabricius 1775)
 v. *concinnus* (Sturm 1818)

270 *cristatus* Dufour 1820

Abax Bonelli 1810

271 *parallelepipedus*
 (Piller & Mitterpacher 1783)
ater (Villers 1789)

— *parallelus* (Duftschmid 1812)

Platyderus Stephens 1828

272 *ruficollis* (Marsham 1802)

Calathus Bonelli 1810

273 *fuscipes* (Goeze 1777)

274 *erratus* Sahlberg 1827

275 *ambiguus* (Paykull 1790)

276 *melanocephalus* (Linnaeus 1758)
 v. *nubigena* Haliday 1838

277 *mollis* (Marsham 1802)
 278 *micropterus* (Duftschmid 1812)
 279 *piceus* (Marsham 1802)
Sphodrus Clairville 1806
 280 *leucophthalmus* (Linnaeus 1758)
Laemostenus Bonelli 1810
 281 *terricola* (Herbst 1783)
 282 *complanatus* (Dejean 1828)
Synuchus Gyllenhal 1810
 283 *nivalis* (Panzer 1797)
Odontonyx Stephens 1827
 284 *rotundatus* (Paykull 1798)
Agonum Bonelli 1810
 285 *quadripunctatum* (Degeer 1774)
 286 *sexpunctatum* (Linnaeus 1758)
 287 *ericeti* (Panzer 1809)
 288 *gracilipes* (Duftschmid 1812)
 289 *marginatum* (Linnaeus 1758)
 290 *mülleri* (Herbst 1785)
 291 *versutum* (Gyllenhal 1827)
 292 *nigrum* Dejean 1828
 293 *viduum* (Panzer 1797)
 294 *moestum* (Duftschmid 1812)
 v. *emarginatum* (Gyllenhal 1827)
 295 *sahlbergi* Chaudoir 1850
 296 *livens* (Gyllenhal 1810)
 297 *assimile* (Paykull 1790)
 298 *ruficorne* (Goeze 1777)
 299 *obscurum* (Herbst 1784)
 300 *dorsale* (Pontoppidan 1763)
 301 *scitulum* Dejean 1828
 302 *micans* Nicolai 1822
 303 *fuliginosum* (Panzer 1809)
 304 *piceum* (Linnaeus 1758)
 305 *gracile* (Gyllenhal 1827)
 306 *thoreyi* Dejean 1828
 v. *puellum* Dejean 1828
Odacantha Paykull 1798
 307 *melanura* (Linnaeus 1766)
Masoreus Dejean 1828
 308 *wetterhali* (Gyllenhal 1813)
Lebia Latreille 1802
 309 *cyancephala* (Linnaeus 1758)
 310 *chlorocephala* (Hoffmannsegg
 1803)
 v. *chryscephala* Motschoulsky
 1864
 311 *crux-minor* (Linnaeus 1758)
 — *scapularis* (Fourcroy 1785)
 — *marginata* (Fourcroy 1785)
Demetrias Bonelli 1810
 312 *monostigma* Samouelle 1819
 313 *atricapillus* (Linnaeus 1758)
 314 *imperialis* (Germar 1824)
Dromius Bonelli 1810
 315 *longiceps* Dejean 1826
 316 *linearis* (Olivier 1795)
 317 *agilis* (Fabricius 1787)
 v. *bimaculatus* Dejean 1825
 318 *angustus* Brullé 1834
 319 *meridionalis* Dejean 1825
 v. *discus* Puel 1919
 320 *quadrimaculatus* (Linnaeus 1758)
 321 *quadrinotatus* (Panzer 1801)
 322 *quadrifasciatus* Dejean 1825
 323 *vectensis* Rye 1873
 insignis auct. *nec* Lucas 1846
 324 *sigma* (Rossi 1790)
 325 *melanocephalus* Dejean 1825
 326 *notatus* Stephens 1827
 nigriventris Thomson 1857

Metabletus Schmidt-Goebel 1846	Cymindis Latreille 1806
? <i>Syntomus</i> Hope 1838	332 <i>axillaris</i> (Fabricius 1794)
327 <i>obscuroguttatus</i> (Duftschmid 1812)	333 <i>vaporariorum</i> (Linnaeus 1758)
328 <i>truncatellus</i> (Linnaeus 1761)	Polistichus Bonelli 1810
329 <i>foveatus</i> (Fourcroy 1785)	334 <i>connexus</i> (Fourcroy 1785)
Microlestes Schmidt-Goebel 1846	Drypta Latreille 1796
330 <i>maurus</i> (Sturm 1827)	335 <i>dentata</i> (Rossi 1790)
Lionychus Wissmann 1846	Brachinus Weber 1801
331 <i>quadrillum</i> (Duftschmid 1812)	336 <i>crepitans</i> (Linnaeus 1758)
v. <i>bipunctatus</i> Heer 1838	— <i>sclopeta</i> (Fabricius 1792)
v. <i>unicolor</i> Schilsky 1888	

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SIPHONAPTERA FROM GLOUCESTERSHIRE, 4*

By R. S. GEORGE, F.L.S., F.R.E.S.

In the earlier papers of this series 33 species and subspecies of fleas have been recorded from Gloucestershire. Since the publication of the first two papers, Mr. F. G. A. M. Smit (1955) has published the descriptions of two new subspecies additional to the British List. In the list below the known Gloucestershire flea-fauna is increased by four species. All the records available to date (15.vi.56) of the new Gloucestershire species are given and all the specimens but one have been taken by myself.

Palaeopsylla soricis soricis (Dale), 1878. 1 ♂ from *Sorex araneus*, Podsmead, Gloucester, GE., 20.iv.55; 1 ♂ from same host, Podsmead, 11.vi.55; 1 ♂ 1 ♀ from same host, Podsmead, 8.iv.56; 2 ♂♂ 1 ♀ from same host, ♀ specimen, Podsmead, 12.iv.56.

Ctenophthalmus nobilis nobilis (Rothschild), 1898. 1 ♂ from ♂ *Mustela nivalis*, Gloucester, GE., 28.ix.55, det. confirmed by F. G. A. M. Smit. I hardly expected to get this from near to Gloucester after examining the distribution map on p. 358 of Rothschild & Smit, 1955. This weasel, in a sickly condition, was caught easily in a field on the south side of Gloucester. As its body cooled the fur of the weasel became an amazing sight as thousands of lice (*Trichodectes mustelae* (Schrank), 1803, (Mallophaga: Trichodectidae) (det. Miss T. Clay)) climbed to the tips of the hairs, almost every hair carrying a louse. Also removed from the body was a great number of mites and the following fleas: 1 ♂ *Palaeopsylla minor minor* (Dale) and 8 ♀♀ *Ctenophthalmus nobilis* ssp. Unfortunately the females of the two subspecies of *nobilis* cannot be separated. *Ctenophthalmus nobilis vulgaris* Smit, 1955. Apart from the single specimen of *n. nobilis* recorded above all the males of species that I have critically examined recently have been ssp. *vulgaris*. At some time later I shall make a detailed list of all the known occurrences of this form within the county.

Ischnopsyllus elongatus (Curtis), 1832. 1 ♂ from ♀ *Nyctalus noctula*, Churchdown, GE., 30.v.56.

Nycteridopsylla longicaps, Rothschild, 1908. 1 ♂ from ♂ *Pipistrellus pipistrellus*, Quedgeley, GE., 4.ii.55; 2 ♂♂ from ♂ *Nyctalus leisleri*, Gloucester, 28.iii.55, A. Jones; 1 ♂ from ♂ *P. pipistrellus*, Brockworth Church, GE., 2.iii.56; 1 ♀ from ♂ *P. pipistrellus*, Brockworth Church, 3.iii.56; 1 ♂ 1 ♀ from ♂ *P. pipistrellus*, Badgeworth Church, GE., 5.iii.56; 1 ♂ from ♂ *P. pipistrellus*, same locality, 5.iii.56.

* No. 3 in this series is in press with the Cotswold Naturalists' Field Club for their Proceedings, 1954. No additions to the county list were made therein.

Ceratophyllus styx styx Rothschild, 1900. The specimens recorded from Haw Bridge (George, 1954) are reported by Smit (l.c.) to be a mixture of the Continental, nominate subspecies and hybrids between it and the new British subspecies, *C.s.jordani*, Smit, 1955. It could be assumed, therefore, that *C.s.jordani* existed fairly recently at Haw Bridge though no actual examples were taken. As the host colony has been wiped out by falls of the river bank, with no renesting, the matter cannot be settled.

NEW HOST/PARASITE RECORDS

Nyctalus leisleri/Nycteridopsylla longiceps. This relationship is not recorded in Costa Lima & Hathaway, 1946 (where, incidentally, *leisleri* is incorrectly given as a synonym of *N. verrucosus*, the latter being probably a race of *leisleri*), and Smit tells me that he has no other knowledge of it. Further interest is given to this record by the fact that the host has been recorded on only two earlier occasions in Gloucestershire—Cirencester, prior to 1878, and Bristol, 1945.

Apodemus flavicollis/Ctenophthalmus nobilis vulgaris. From what appears to be the first specimen of the host from Gloucestershire I took at Podsmead, 6.vi.55, 1 ♂ *C. n. vulgaris*, 1 ♀ *C. nobilis* and 3 ♀♀ *Megabothris turbidus*. The relationship of the first species with the host is new.

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A NOTE ON TRICHOPTERA IMBIBING NECTAR

Records of Caddis flies imbibing nectar are rare, and the following observations may therefore be of interest. *Limnephilus flavicornis* (F.): Several specimens seen imbibing from a flower head-head of *Angelica sylvestris* L. (Wild Angelica), Sutton Broad, Norfolk, 6.ix.56. *Grammotaulius atomarius* (F.): A single specimen seen imbibing from a large Umbel, Wood Walton Fen, Hunts., 23.ix.56. I am indebted to Mr. D. E. Kimmins for the identification of these specimens.

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BOOK REVIEWS

Proceedings and Transactions of the South London Entomological and Natural History Society for 1955. Pub. Jan. 1957. Pp. xlii, 189 Eight plates (three coloured). Wrappers. Price £1. 2s. 6d.

Anyone interested in British entomology and who is not a member of the 'South London', or who does not buy annually the 'Proceedings and Transactions' is forfeiting one of the best regular publications on this subject. This volume is no exception to the consistently high standard maintained for many years now. Apart from the always interesting account of the Annual Exhibition and the illustrations of some of the best insects shown at that meeting, the Society has again included a couple of photographs of members at Field Meetings.

The President's Address by Mr. H. D. Buck on *The British Mycetophagidae and Colydiidae* (COL.) has very good Keys to the species and is illustrated by excellent line drawings. Mr. R. F. Bretherton's *A List of the Macrolepidoptera and Pyralidina of N.W. Surrey* will be welcomed by all lepidopterists living in London and the Home Counties as well as by many more. Surrey, although well worked, is not well 'recorded' except by a plethora of short notes to the various journals over the years, and this work is a valiant attempt to tidy things up for a large part of this fine collecting county.

The best thing in a very good volume is Mr. G. Haggett's *Larvae of the British Lepidoptera not figured by Buckler*, beautifully illustrated by three coloured plates from paintings executed by Mr. Haggett. The only grumble we have with this most excellent paper is its title! The text has a much wider application than the title would suggest and treats, in a thorough and admirable manner, with the habits, history in Britain, distribution, systematic position, etc., as well as the larval description of each species shown. The volume is worth its price for this paper alone.

E. W. C.

Feldheuschrecken, by Dr. Max Bier, 1956. Die Neue Brehm-Bucherei, Heft 179. Pp. 48, 40 text figs. A. Ziemsen Verlag. Wittenberg Lutherstadt. Price 6s.

This latest addition to a now celebrated series of monographs deals with the Acrididae (Orthoptera). Well illustrated with photographs and line drawings, it deals adequately with the habits, life-histories, stridulation, natural enemies and economic importance of the insects under review.

Closely related families are briefly mentioned and a short list of relevant literature is included.

A.E.G.